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the OIL AND GAS JOURNAL

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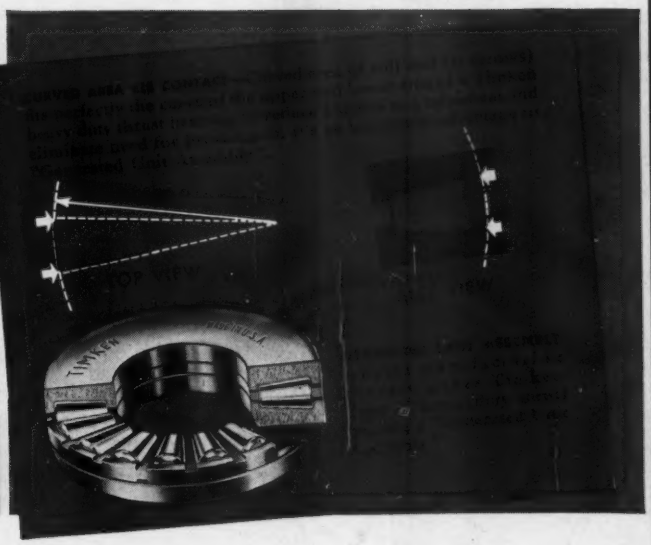

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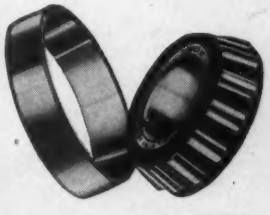

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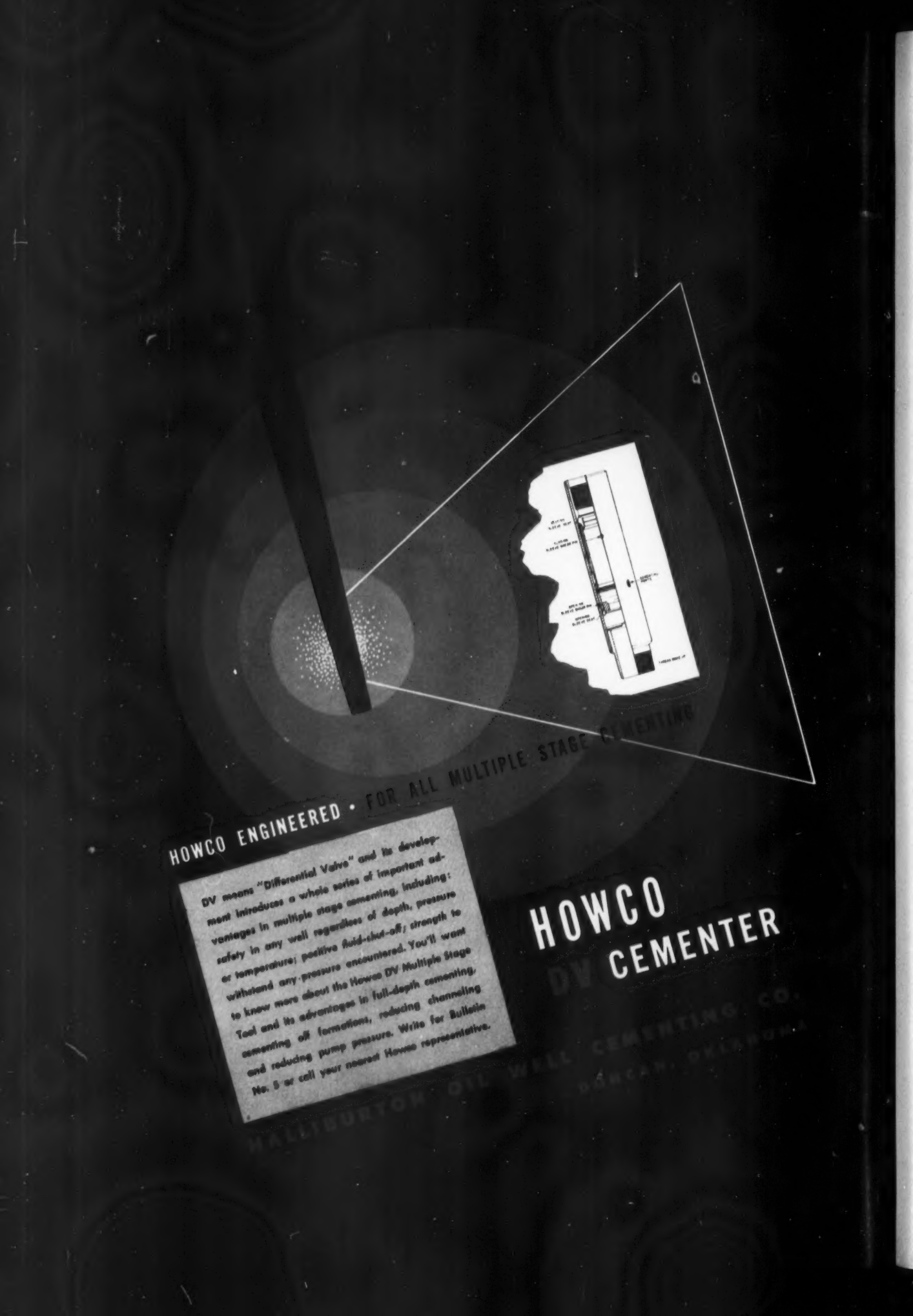
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the OIL AND GAS JOURNAL

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THE OIL AND GAS JOURNAL

A Lusty Infant

A DECADE ago a few people who were familiar with the background of its birth began to refer to the production of liquefied gases as the "infant" of the petroleum industry. They could visualize markets for these light hydrocarbons of the natural-gasoline plants and refineries exclusive of fixed gases which for many years were disposed of as fuel or wasted.

It is doubtful if the most optimistic pioneer in this new phase of petroleum activity envisioned the expansion that has taken place over the past few years reflected this week in the christening of a ship at Beaumont with a capacity to transport 33,000 bbl. of propane and other liquefied products in coastal movements. This is a long jump from the few tank cars and smaller containers which were sufficient for the transportation needs of the early thirties.

Production of liquefied gases in this country is now at the rate of about 4,600,000 gal. or 110,000 bbl. daily. The production of natural gasoline did not reach that level until 1935, although the first output was marketed previous to World War I.

The bulk of the supply comes from the owners of approximately 520 natural-gasoline and cycling plants, most of whom now have fractionating facilities to recover propane, butane, and other liquefiable gaseous products in their plant operations. For several years the supply exceeded the seasonal demands and returns generally did not justify the expenditures required to fractionate and store the light fractions.

Those who founded and expanded new markets and conditions brought about by the war changed this situation. Aside from their volatility value in blending motor fuels these hydrocarbons are the raw materials in the refining of aviation and other high-octane fuels and petrochemicals, including essential ingredients used in the manufacture of synthetic rubber.

But a large part of the growth in liquefied-gas requirements in recent years is accounted for by the rapidly expanding demands of industrial users and the commercial and domestic consumption in the small towns and cities and rural areas away from the natural-gas systems. The home owners want the convenience of gas fuels while industrial and commercial users find them essential in their operations.

The net result is that the manufacturers and transporters of liquefied gases have not been able to keep pace with all the postwar demands. But there are untapped sources of supply, and production will further expand, assuming a continuance of a favorable price structure. Over-all, progress in liquefied-gas manufacture and marketing represents a major contribution to petroleum conservation and to an improved standard of living for millions of our people.

Sunray, Skelly, If Merged, to Have $210,000,000 in Assets

by Charles J. Deegan

AN independent company with assets of a size that would put it in the list of the top 20 oil companies appeared to be a strong probability, as seemingly authentic, but officially unconfirmed reports circulated that Sunray Oil Corp. and the financial house of Eastman, Dillon & Co. are completing negotiations to buy controlling interest in Pacific Western Oil Corp. Reports that Eastman, Dillon & Co. have an option to buy Pacific Western stock at $68 a share before December 15 are incorrect, according to a well-informed source.

Sale of Pacific Western stock interest would be the first step in a series of transactions which would have as their objective a merger of Skelly Oil Co., Pacific Western Oil Corp., and Sunray Oil Corp. into a new company to be called the Sunray-Skelly. Although Tide Water Associated Oil Co. stock would be involved in intermediate stages, it is understood that this stock will be disposed of and that Tide Water will not be involved in the final merger.

The proposed Sunray-Skelly company would then have around $210 million of total assets (based on 1946 annual reports). This would compare with such companies as Phillips Petroleum Co. at $332,000,000, Atlantic Refining Co. $296,000,000, Union Oil Co. of California $239,000,000, Tide Water Associated Oil Co. $239,000,000, Pure Oil Co. $223,000,000, Sun Oil Co. $207,000,000, Continental Oil Co. $178,000,000, and Ohio Oil Co. $144,000,000, based on 1946 annual reports.

Pacific Western is the key to the merger because in addition to other properties, it owns 46.71 per cent of the stock of Mission Corp. (a holding company) and 9.03 per cent of the Tide Water Associated's stock. Mission Corp. in turn owns 59.37 per cent of the stock of Skelly, and 20.97 per cent of Tide Water Associated's stock. Control of Pacific Western almost assures control of Mission, and control of Mission gives nearly a 60 per cent interest in Skelly.

It is pointed out in connection with the sale and merger plans that in addition to the financial arrangements involved, the position of the Department of Justice in regard to the merger of competing companies and the attitude of minority stockholders are of importance in carrying out the entire program.

The data in Table 1 gives some figures on operations for 1946, on the proposed new company:

Tide Water Associated, which according to reports will be clear of the final merger, is as large or larger than the combined companies will be if the merger goes through. Tide Water's annual report showed $238,000,000 total assets, 89,379-bbl. daily average production; 5,791 operating wells on 125,055 acres of producing properties, with 2,150,035 acres of nonproducing leases and royalties; refinery runs of 161,211 bbl. per day of crude.

Both Skelly and Tide Water Associated are substantial figures in the natural-gasoline business, with Sunray having some interest in plants not fully owned. The location and capacity of the refineries of the companies involved, is given in Table 2.

TABLE 1—OPERATIONAL DATA

	Sunray	Skelly	Pac. West,	Total
Total assets 12-31-46	$91,936,000	$102,458,000	$16,054,000	$210,448,000
Daily average production (bbl.)	33,873	37,260	9,134	80,267
Number of producing wells	2,468	3,187	444	6,099
Producing acreage (acres)	80,803	182,046	4,516	267,365
Nonproducing leases and royalties (acres)	649,810	1,173,115	358,301	2,781,226
Crude runs to stills, daily average (bbl.)	9,502	28,974	.....	38,476

TABLE 2—REFINERIES

Company and location—	Daily crude oil capacity (bbl.)	Daily cracking capacity (bbl.)	Principal marketing areas
Sunray Oil Corp:			
Santa Maria, Calif.	7,500	4,000	California
Allen, Okla.	12,000	7,000	Oklahoma, Midwest
Beckett, Okla.	(*)	10,000	
Totals	19,500	21,000	
Skelly Oil Co.:			
Eldorado, Kans.	25,000	8,000	Southwest, Midwest
Tide Water Associated Oil Co.:			
Drumright, Okla.	12,000	5,000	Oklahoma, Midwest
Wilmington, Calif	14,000	8,200	West Coast States
Avon, Calif.	60,900	51,400	West Coast States
Bayonne, N. J.	70,000	32,500	Eastern area
Totals	156,900	97,100	

*Crude distillation facilities to be installed.

Heads of the two oil companies involved in reports of a possible merger are W. G. Skelly, president of Skelly Oil Co., and C. H. Wright, president of Sunray Oil Corp.

Houston Offices Moved

The South Texas division of the producing department, The Texas Co., Houston, this week completed moving all headquarters offices from The Texas Co. building to the National Standard Building, Main and McKinney street.

W. J. Murray to Remain On Railroad Commission

WILLIAM J. MURRAY, well-known petroleum engineer and a member of the Texas Railroad Commission, said October 2 in Austin that he will continue as a member of the commission and not resign to take Max Ball's post as director of the Oil and Gas Division of the Department of the Interior.

Murray's statement settled widely circulated reports he would succeed Ball. In Washington, it was reported Ball is hoping to return to private industry in the field of geology by the end of the year. Murray, one of the first technically trained men to sit on the Texas commission, was appointed to fill the post vacated by Beauford Jester, Texas governor.

"Naturally, I am complimented," Murray said. "However, I do not feel I could accept it because as a member of the Railroad Commission for eight months, I have found problems so challenging that I prefer to remain here and serve Texas to the extent of my ability.

"Particularly in the field of conserving our irreplaceable oil and natural gas do I feel that the very economic well being of Texas is at stake. Since I have spent all my life in the oil fields of Texas and all my technical training has been in conservation, I would not want to pass up my present opportunity to make some contribution to preserving our natural resources."

Murray is expected to be a candidate for the commission next year.

Oil Companies Given Recognition for Safety

The oil industry is continuing to make an impressive showing in regards to its safety records as witnessed by the number of awards recently given to the various oil companies.

Gulf Oil Corp. and Gulf Refining Co. received the Joseph A. Holmes safety awards recently in Tulsa. The awards were presented by R. D. Bradford, engineer in charge of the McAlester, Okla., station, U. S. Bureau of Mines, to Vice President Rush Greenslade.

Stanolind Oil & Gas Co. has been awarded the distinguished service safety award by the National Safety Council's president in a formal presentation in Tulsa to E. F. Bullard, Stanolind's president.

Socony-Vacuum Oil Co.'s safety record will be acclaimed this week at the National Safety Congress in Chicago when the manufacturing department of the company will be presented a trophy for its outstanding safety record.

Bulletin Available

A 171-page bulletin covering the Well Logging Methods Conference sponsored by Texas A. & M. College is now available. The publication contains 13 papers which were presented at the meetings. They were arranged for by Prof. Harold Vance, head of the department of petroleum engineering at the college. The new bulletin also includes a bibliography on well-logging methods, listing caliper, drilling rate, electrical, mud, radioactivity, and temperature logging.

The publication, Bulletin No. 93, is issued by the Engineering Experiment Station, Texas A. & M. College, College Station. Individual copies of the bulletin will be mailed free on request; multiple copies are priced at 25 cents each.

A.I.M.E. Section to Meet

Bernard J. Bennett, The California Co., will discuss the Kobe deep oil-well pump at the monthly meeting of the Delta section of the American Institute of Mining and Metallurgical Engineers October 14 at the Petroleum Club in New Orleans.

New Company Organized By Former Anchor Officials

Formation of a new marketing company for natural gasoline, L.P.G., and associated equipment in Tulsa was announced October 3 by its four organizers, following resignation from Anchor Petroleum Co. and Anco Manufacturing & Supply Co.

E. Q. BECKWITH

J. S. FEROE

The new firm, Beacon Petroleum Co., will be headed by E. Q. Beckwith, former manager of the L.P.G. procurement division of Anchor Petroleum, with J. S. Feroe, vice president, and H. R. McFarland, secretary, also formerly with Anchor, and R. E. Bolinger, treasurer, former purchasing agent for Anco Manufacturing & Supply.

Beckwith, before joining Anchor, had been engaged in engineering, sales, and procurement for the Philgas division of Phillips Petroleum Co. for more than 15 years. Feroe, former assistant to the president of Anchor and manager of the natural-gasoline division, had previously finished 14 years' service with Hanlon-Buchanan, Inc. McFarland's experience with Trinity Gas Corp. and Geophysical Service, Inc., both of Dallas, preceded his 2 years as sales engineer for Anchor. Bolinger had had 12 years' experience with the equipment department of Phillips Philgas division, National Supply Co., and United Petroleum Gas Co. of Minneapolis.

PURCHASING AGENTS HOLD DISTRICT MEETING

At the first annual Southwest purchasing conference of the National Association of Purchasing Agents, oil-industry representatives comprised the largest group. Shown here are several oil-industry purchasing officials at the second day of the conference which was held at the Tulsa Hotel in Tulsa October 2-3. (Seated) Ben R. Newbery, Lone Star Gas Co. general conference chairman and former president of the N.A.P.A.; W. L. James, Stanolind Oil & Gas Co., Tulsa, program chairman. (Standing) Ira C. Jared, Sun Oil Co., Dallas, former vice president, N.A.P.A.; Sam R. Harper, Pure Oil Co., Houston, president of the Houston association; J. B. Thompson, Shell Pipe Line Co., Houston; and N. E. Waldie, Humble Oil & Refining Co., Houston

Conciliatory FPC Attitude Indicated By Smith in A. G. A. Talk

CLEVELAND.—A willingness to go part way with the natural-gas industry in establishing a field price method for determining the cost of natural gas produced by pipe-line companies was expressed by Nelson Lee Smith, chairman of the Federal Power Commission, in his first public expression on this controversial question which is now the subject of pending legislation.

Smith was one of the featured general-session speakers at the twenty-ninth annual convention of the American Gas Association here this week. In his talk he insisted that FPC retain jurisdiction over production and gathering properties owned by natural-gas companies for accounting and information purposes, but not necessarily for purposes of regulation. He also defended FPC's method of regulating such production as used so far but admitted that the jurisdictional situation is confusing and that the problem of suitable rate standards must be faced directly.

"For the most part," Smith said, "the natural-gas industry advocates rate-making which would reflect the assignment, in one way or another, of a 'field price' to gas produced by pipe lines and their affiliates. Although in some respects their arguments have been overstated. The weight of economic and equitable considerations appears to be on that side of the case.

"In simplest terms, it does not seem to me reasonable that gas coming from a common pool should have one value — presumably determined by conditions of demand and supply —if taken from the well of an independent producer, but another value—fixed by regulatory authority on the basis of net cost alone—if drawn from an adjacent well owned by a pipe line or its affiliate. I think that in rate-making weight should be given to the commodity value of all the gas, and not just that portion of it that is independently produced."

Urges Suitable Standards

Smith warned that he is not suggesting anything like the field-price standard of some extreme proposals which show little consideration for the interests of either independent producers or ultimate consumers. He added that FPC must be in position to apply suitable standards to prevent price-rigging in fields where there is no real market price.

Smith also called on the industry to declare a moratorium on expansion of market demands until transmission capacity can catch up to current requirements, but said this is a matter for management and state commissions and denied that FPC is attempting to control end use of gas. He warned that the industry is confronted with a runaway market which threatens to deplete reserves too rapidly.

A similar note was sounded by Max W. Ball, director of the Oil and Gas Division of the Interior Department. He told the industry it should raise the field price of natural gas, partly to promote conservation but chiefly to make sure that coal will carry its proper share of the national fuel load.

Pointing out that the demand for gas is growing faster than for coal or fuel oil, Ball said a survey of three Midwest cities showed that in the past 3 years the household price of coal has gone up 16.4 per cent, fuel oil up 30.4 per cent, and gas down 11 per cent, which put the heating value of gas below that of oil and not far above coal. This means, he said, that in most natural-gas markets we have already reached and passed the price relationship at which gas is in competitive balance with other fuels, and if the trend continues "most of the fuel load of

(Continued on page 242)

A. G. A. Elects Hendee; Hancock Honored

NEW officers of the American Gas Association elected this week at the twenty-ninth annual convention in Cleveland included Robert W. Hendee, president of Colorado Interstate Gas Co. as first vice president.

New president of the association succeeding R. H. Hargrove, president of Texas Eastern Transmission Corp., is Hudson W. Reed, president of Philadelphia Gas Works Co. New directors of the association for 2-year terms include Joseph N. Greene, president, Alabama Gas Co.; D. A. Hulcy, president, Lone Star Gas Co.; C. H. Zachry, president, Southern Union Gas Co.; and James S. Moulton, vice president, and executive engineer, Pacific Gas & Electric Co.

At the meeting, the association's highest honor was conferred on Harry D. Hancock, president of Gas Advisers, Inc., New York. Hancock, a leader in the field of natural-gas research, received the A.G.A. Distinguished Service Award for the most outstanding recent contribution of an individual toward advancement of the gas industry. He was cited for his "able and energetic leadership from which the natural-gas industry in particular has benefited beyond measure from added engineering knowledge, improved technique, and standards in connection with natural-gas production, transmission, and measurement problems."

For heroic action during the Texas City disaster, James Walter Williams, a meterman of Houston Pipe Line Co., was awarded the association's Meritorious Service Medal. Williams, said the A.G.A. citation, on his own initiative not only closed off the main block valve controlling all gas entering the stricken area but rendered conspicuous service as fire marshal.

ROBERT W. HENDEE

HARRY D. HANCOCK

this week

INTERNATIONAL—Creole reports August production of 598,062 bbl. daily. . . . ¶Macmillan Petroleum discloses plans for test wells in grants from the Italian Government in Sicily. . . . ¶Pemex awards contract for 30,000-bbl. refinery at Salamanca to Arthur G. McKee & Co. . . . ¶Standard-Vacuum renews negotiations for exploratory concession in the Philippines. . . . ¶Orville Harden, Jersey Standard vice president, returns from conference with Gulbenkian in Lisbon amid predictions amicable settlement of dispute between Iraq Petroleum partners will soon be reached. . . .

NATURAL GAS—Nelson Lee Smith, FPC chairman, in talk at A.G.A. convention, indicates willingness to meet industry in setting up a field-price method of determining cost of gas produced by pipe-line companies. . . . R. H. Hargrove, retiring A.G.A. president, says construction of gas lines is approaching a $400,000,000 a y ar rate. . . .

GOVERNMENT—W. J. Murray, Texas Railroad Commission member, scotches rumors he will resign and succeed Max W. Ball as OGD head. . . . ¶John A. Loftus resigns as head of State Department's Petroleum Division, plans to take part-time teaching positi n. . . .

REFINING—Winnsboro Refining announces plans to build 3,000-bbl. topping plant in East Texas. . . . ¶Alberta official reports tests of oil at experimental government bituminous-sand plant in the Athabaska district will start next spring. . . . ¶Butadiene production at Sinclair's Houston plant halted and plant shut down under government order. . . . ¶WAA announces sale of high-octane plant in Ponca City to Continental. . . .

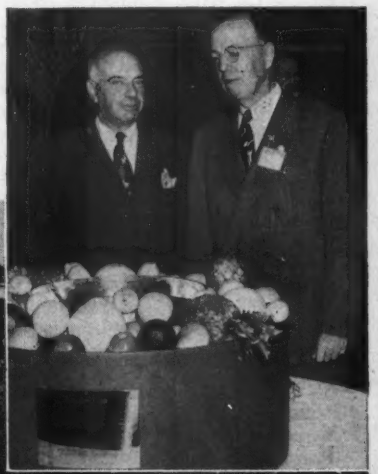
CONSERVATION—Operators in Old Ocean field, Brazoria County, Texas, notify Railroad Commission all flaring has been eliminated. . . . ¶Interstate Oil Compact Commission's new secondary-recovery committee holds initial meeting, prepares program for activities. . . .

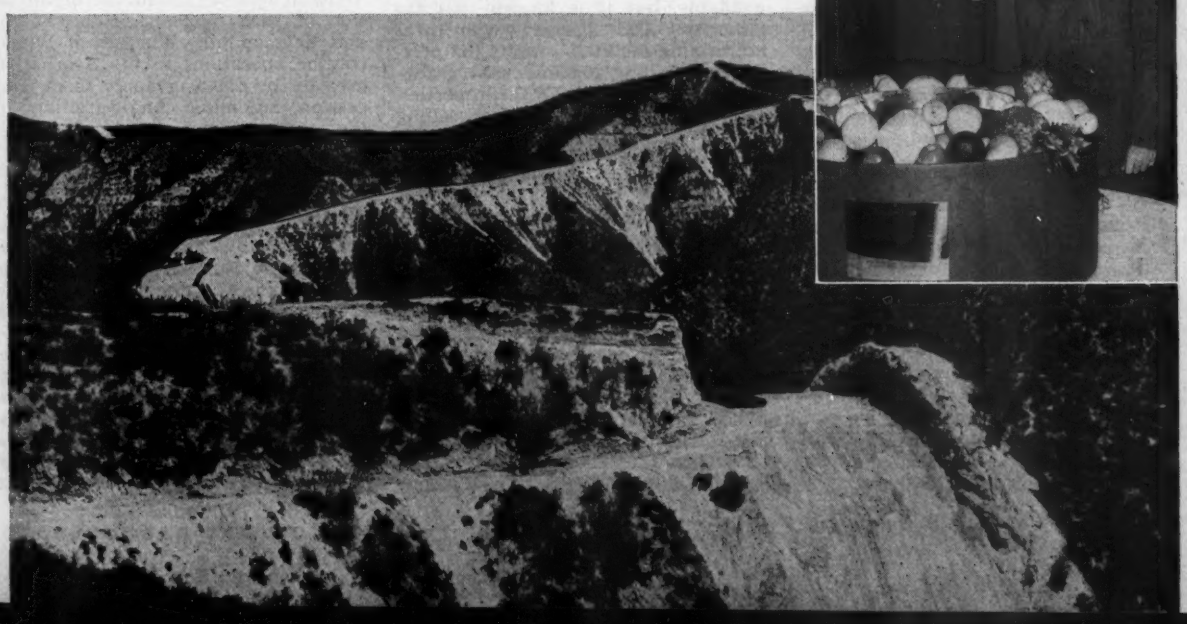
EXPORTS—Commerce Department announces licensed steel-mill products for export in fourth quarter totaled 557,150 tons, including 90,000 tons of oil pipe. . . . ¶Special Government study shows exports of oil-industry equipment to Russia during first half totaled $9,627,000. . . .

PRODUCTION—The Oil and Gas Journal compilation shows Texas production the week ended October 4 up 24,345 bbl. to new all-time high of 2,358,100 bbl. daily. . . .

EXPLORATION—Kirby Petroleum opens oil production in East Goose Creek gas area, Texas Gulf Coast. . . . ¶Shallow oiler hit by Sunray southwest of discovery well of Eola pool, southern Garvin County, Oklahoma. . . . ¶Sizable gas field indicated by addition of two wells to the new pool underlying southeast part of Elyria, Ohio. . . . ¶New oil discovery 1 mile southeast of east end of Washburn Ranch field, Southwest Texas, flows clean oil from open hole at 5,248-53 ft. . . . ¶Wabash County, Illinois, wildcat gets initial pumping production of 250 bbl. daily. . . . ¶Shell Oil Co., Inc., opens new producing zone in Ten Section field of California. . . .

Construction of the world's first 30-in. high-pressure natural-gas pipe line was completed late in September. It extends from Blythe, Calif., to near Los Angeles and will connect with a 26 and 24-in. line to deliver Texas natural gas to the West Coast. The 30-in. California section was built by H. C. Price Co. for Southern California Gas Co. and Southern Counties Gas Co. Some of the terrain crossed by the line is shown below. Right is Harold C. Price, president of the contracting company, and Frank S. Wade, president of the two California gas companies, shown at the recent meeting of the Pacific Coast Gas Association during commemoration of the line's completion. The plaque in the picture is attached to a piece of the 30-in. pipe





International

WORLD-WIDE OIL DEVELOPMENTS

I. P. C. Partners Continue Efforts Toward Amicable Settlement

by Warren W. Burns

REGARDLESS of whether the validity of the Red Line Agreement —part of the Iraq Petroleum Co., Ltd.'s contract—will be first established by the British courts or whether C. S. Gulbenkian, the minority 5 per cent partner in I.P.C., first comes to terms with the two United States oil companies in I.P.C., which, for all practical purposes, are now partners in Arabian American Oil Co., a settlement appears to be only a matter of time. Everyone concerned prefers an amicable out-of-court agreement.

In joining forces with Aramco in the world's largest oil deal, Standard Oil Co. (N.J.) and Socony-Vacuum Oil Co., Inc., completed another chapter of the negotiations last week when Orville Harden, Jersey Standard vice president and director, returned to New York after a 5-day visit with Gulbenkian in Lisbon—Gulbenkian's home.

Interviewed in his stateroom aboard the America as the ship nosed its way into New York harbor, Harden said the Lisbon meeting with Gulbenkian was most cordial; that the various problems arising out of their respective Middle East interests were fully discussed; but that no conclusions were reached.

Declines to Elaborate

Harden, who is also an Aramco director, declined to elaborate on his brief observations. However, from other sources it is known that Cie. Francaise des Petroles has not yet dropped its suit in the British courts, the suit which would, presumably, decide whether the restrictive Red Line Agreement, drawn up before World War I and reaffirmed in 1928, is valid today.

The French suit has resulted in a countersuit by the two United States oil companies in which a declaratory judgment on the validity of of the Red Line Agreement (and for that matter the entire I.P.C. contract) is sought. A hearing date is still pending on the court calendar.

Gulbenkian, who is presumably not particularly disturbed over the expanded Aramco partnership, nevertheless is using the Red Line Agreement as a technical basis upon which to strike a more favorable bargain. Observers say that "both Gulbenkian and Harden are born traders" and that a settlement undoubtedly will be consummated before the matter is thrashed out in the courts.

From sources other than Harden it is also known that Jersey Standard and Socony-Vacuum — neither of which originally sought nullification of the Red Line Agreement — feel quite certain that the British courts would declare the Red Line Agreement invalid.

Details concerning the disagreement between Gulbenkian and the two United States companies are not available, but it is known that the minority I.P.C. partner—who owns no refining facilities—wants the privilege of calling for increased crude-oil production from I.P.C. properties, at his discretion, and either selling this crude on the open market at the highest price or having his partners buy it at some set price.

Details Not Available

Meanwhile, it has been learned both Jersey Standard and Socony-Vacuum have a working agreement with Aramco whereby Saudi Arabian production is being increased, the trans-Arabian pipe line being built, and other expansion carried out. Aramco has also named two other Jersey Standard directors, in addition to Harden, to the Aramco board. They are: Stewart P. Coleman and John R. Suman. The Socony-Vacuum director on Aramco's board is Harold Sheets, Socony-Vacuum board chairman.

Concerning a recent report by an Arab spokesman in London that Arab states might nullify oil concessions if the United Nations favored partition of Palestine, Harden said he felt sure that both the companies and countries concerned had every intention of living up to their concession agreements. (For a discussion of this situation, see The Oil and Gas Journal, October 4, page 44.)

Other developments concerning Middle East oil last week included a report from Teheran that an Iranian deputy suggested the seizure of Bahrein Island, which is a British protectorate and on which the United States-owned Bahrein Petroleum Co., Ltd., produces crude oil and operates one of the three Persian Gulf refineries.

Bahrein was last under Iranian rule in 1783 but since then has been in the possession of the Ataiba Arabs under British protection. The Iranian deputy's suggestion, however, was not taken seriously, according to observers.

Another report from Iran said the Levantour Co. of Teheran had written a letter to the president of the Iranian Parliament stating that this organization was ready with capital of around $32,000,000 to form an Iranian oil company.

Earlier, a parliament deputy from Teheran had suggested the organization of such a company to explore and develop oil. Whether it would confine operations to the Azerbaijan area in the north or apply for a concession adjoining Anglo-Iranian in the south was not stated.

Soviet Pipe Line In Full Operation

The Saratov-Moscow natural-gas pipe line in Russia, approximately a 500-mile line running from the Saratov fields northwest of Moscow, is now reported operating at full capacity. Soviet officials say that the gas supply for domestic consumers in the first 5 months of the current year was overfulfilled, and that during this period, city industrial enterprises received "billions of cubic feet of cheap fuel."

Macmillan Announces Plans for Initial Tests in Sicily

MACMILLAN PETROLEUM CORP. has announced that it is definitely planning the selection of the most favorable location for initial test wells in more than 70,000 acres covered by permits issued to it by the Italian Government in Sicily.

Encouraging reports by its geologists, Macmillan is continuing its geological study of several blocks of acreage covered by its Italian Government permits, according to J. H. Macmillan, of the Macmillan corporation.

The land now held by Macmillan Petroleum under the Italian permits comprises six blocks with a total of 28,400 hectares, Macmillan said. Selection of these tracts was made by Dr. E. K. Soper, petroleum geologist, on behalf of Macmillan.

Macmillan first became interested in the petroleum possibilities of Sicily in 1943. Geological reports made a number of years ago were brought to the company's attention. At that time, concessions had been granted by Mussolini on practically all of Italy and Sicily.

Soper, who was professor of geology at the University of California at Los Angeles for many years, was active at that time with a major oil company and made a particularly comprehensive study and report on the Sicily prospects. However, this company withdrew from Sicily, due to differences arising with Mussolini, and no drilling nor further develpment was carried on, according to an announcement by Macmillan.

Dr. Soper's report on the Sicily possibilities, with its supplemental findings and conclusions, prompted Macmillan to seek concessions in the Italian area. Negotiations during the past 2 years have been carried to a successful conclusion with the Italian Government by Franco Fenzi, a Stanford University graduate and Macmillan representatives in Rome. Further geological study is under way under the direction of Dr. Soper, who recently resigned from the University of California at Los Angeles and is now with Signal Oil & Gas Co. of California.

Macmillan announced it has obtained the loan of services of Enzo Beneo, Italian Government geologist. Beneo is now carrying on a study of the various tracts in the Macmillan holdings.

New Field Discovered By Arabian American

WASHINGTON. — Arabian American Oil Co. has discovered a new field, known as the Buqqua field, midway between Abqaiq and Quatif, in an area formerly considered the north extension of Abqaiq.

One well has been completed and another is drilling. As yet the company has little data on this new structure and the discovery well has not been flow tested but evidences are that its daily flow may be greater than its largest wells in other Saudi Arabian fields.

The company also has four new wells drilling in Abqaiq and one in Quatif.

Palembang Refinery to Go On Stream Late This Month

Following a politically delayed inspection of its oil fields in the Netherlands East Indies, Standard-Vacuum Petroleum Mij.'s Palembang refinery will go on stream late this month with an initial daily throughput of 20,000 bbl. This will be increased to 32,000 bbl. daily by next February while its prewar daily capacity of 45,000 bbl. will be reached later in 1948.

Reconstruction of the refinery, repair and reconditioning of the producing fields and pipe lines and partial rebuilding of the 200,000-bbl. deep-water terminal at Tandjong Oeban, 30 miles southeast of Singapore, have all been accomplished in a year's time against heavy handicaps. H. A. Gibbon, general manager of S.V.P.M., stated Standard-Vacuum was unable to inspect its oil fields and pipe lines until late in July.

Pemex Awards Contract For Salamanca Refinery

Arthur G. McKee & Co., Cleveland, has announced it has been awarded a contract for the design, engineering, purchasing, and construction of a complete new petroleum refinery for Petroleos Mexicanos at Salamanca, Mexico.

The refinery will consist of a 30,000-bbl. crude distillation unit, gas-oil thermal cracking unit, 30,000-kw. generation plant with boilers and water-treating and other auxiliaries, ethyl-blending equipment, shops, warehouses, tankage, and other facilities. It is estimated the refinery will cost approximately $12,000,000.

Design and engineering on this new project are now under way in Cleveland. Construction work will start in 1948, with the project scheduled to be completed in 1949.

Middle East Safeguards Listed by Congressman

REP. DEWEY SHORT (Rep., Mo.), chairman of the House armed services subcommittee, in Cairo last week advocated three "vital" steps necessary to safeguard United States oil interests in Saudi Arabia and the United States' over-all position in the Middle East. Short said the three steps were:

"One, it is essential to maintain newly established pipe-line properties for Arabian American Oil Co., making possible tremendous increases in oil supplies of the Middle East and Europe, which would be available to America in case of emergency.

"Two, an increase in the large number of American citizens in Saudi Arabia necessitates an expanded American legation and American consulates if American interests are to be properly safeguarded.

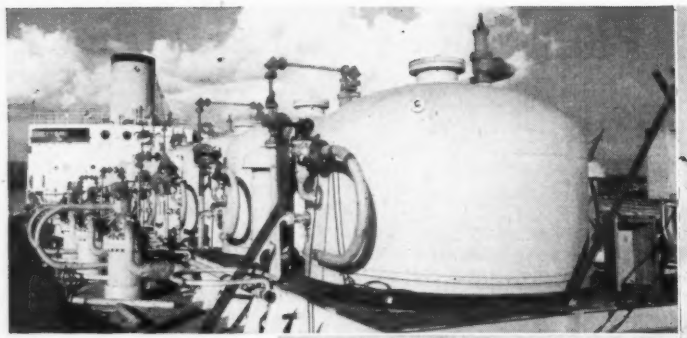
"Three, it is desirable to continue active the Saudi Arabian airport training program currently under way by the American Air Force."

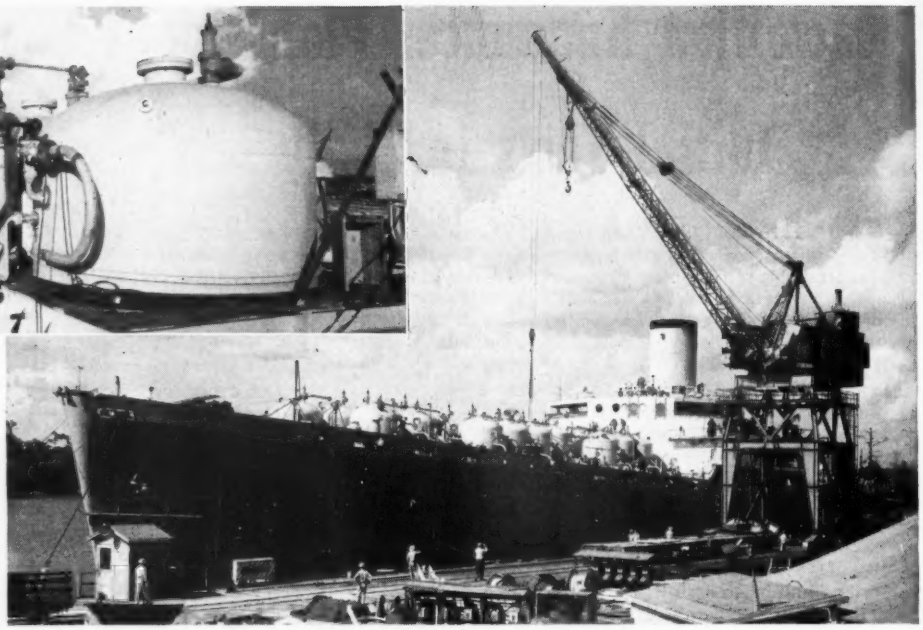
Standard-Vacuum Studies Philippine Concession

Commenting on press reports from Manila that Standard-Vacuum Oil Co. continues to be interested in negotiating with the Philippine Government for a concession to explore and possibly develop crude-oil production there, P. A. Parker, board chairman, said that discussions which commenced 10 years ago have been resumed. His statement follows:

"A special commission recently appointed by President Manuel Roxas is now making a study of the problems relating to the exploration and development of the oil resources of the Philippines for the purpose of making recommendations to the president regarding a national oil policy for that country. Under the circumstances we do not feel free at this time to comment . . . .

"We are especially mindful, however, that such terms should give the fullest consideration to the best interests of the Philippines people, and that any exploration agreement should contribute to their welfare."





Nearing completion the Natalie O. Warren is shown here in the shipyards at Beaumont, Tex. A closeup (above) of some of the portside inboard tanks shows the general piping arrangement installed at each propane container

Warren Completes First Ocean-Going Propane Tank Ship

by R. B. Tuttle

THE first ocean-going vessel ever constructed for the sole purpose of transporting high-pressure propane is scheduled to be christened October 11 in Beaumont, Tex.

The ship is the S.S. Natalie O. Warren, a dry-cargo vessel bought for about $1,000,000 from the U. S. Maritime Commission last year by Warren Maritime Corp. which was organized as a wholly owned subsidiary of Warren Petroleum Corp. Conversion of the vessel into a unique propane tank ship has been carried out by Pennsylvania Shipyards, Inc.

A large number of industry leaders and oil-company executives were invited to the christening by Mrs. W. K. Warren, wife of the president of both Warren corporations for whom the ship was named. A party and dinner dance the evening of October 11 follows the christening ceremonies.

Later this year, the ship will go into service between Norsworthy, near Houston, and Newark, N J. It will carry some 33,000 bbl. making about two trips a month. The vessel's load is equivalent to about 140 tank cars which are now in short supply.

At Newark, Warren is building its first L.P.G. terminal on the East Coast with 50,000-bbl. total storage capacity and loading facilities. Completion is due about November 15. Within recent months Warren has increased its Norsworthy storage to some 60,000 bbl. The new tank ship also will deliver to other large receiving points along the East Coast.

The S.S. Natalie O. Warren is a former CIA ship. During the war it operated as the S.S. Cape Diamond and supported a number of military operations in the Pacific and later was in service returning troops to the United States.

Entirely New Type Ship

Believed to be the safest tanker afloat, the S.S. Natalie O. Warren is the first of an entirely new type of ship. Originally designed for and operating in dry-cargo service prior to being acquired by Warren, the vessel is of combination welded and riveted construction. Welding is employed for joining and attaching the plates while the ribs and other structural members are joined by riveting. In converting the ship to propane tanker service very little of the original construction was altered to accommodate the 68 pressure tanks now installed in the vessel's five holds.

For more than a year before actual conversion operations began, safety and structural design problems were worked out to meet the specifications of the U. S. Coast Guard and the American Bureau of Shipping. Through the cooperation of these two agencies, a special American Petroleum Institute subcommittee and outside consulting and company engineers developed solutions to the problems involved.

Typical of the thoroughness employed in investigating some of the proposed solutions to the difficulties involved in the conversion is that of expansion joints for the various pipe lines. Coast Guard tests on several types of joint especially designed for application to propane service showed the item to be inadequate to provide safety under conditions of actual service aboard ship. The principal difficulty with the joint as discovered from the several months of testing proved to be its inability to accommodate additional movements imparted to pipe line by the ship's hull. Under normal movement from thermal expansion, the joints are said to operate satisfactorily. Hogging and sagging, movement in the ship's structure, on occasion may be several times greater than that experienced from thermal expansion. This movement may oppose, augment or may even be in entirely different planes than movements developed from thermal causes.

Specifications on the propane tanker show an over-all length of 412 ft. 3 in.; displacement at 26 ft.

6¾ in. 11,085 tons; and deadweight of 7,420 tons. Shaft horsepower, produced with turbine units operating on 450 psi. 750° F. total temperature steam, is rated at 4,000. Two oil-fired boilers supply steam for driving the ship's turbines, two compressors and six pumps each of which are also driven by turbines. The tanker's sustained sea speed is given at 14 knots.

Tankage capacity for the carrier is rated at 1,390,000 gal. of commercial propane. Sizes of the various tanks range from 8 ft. to 12 ft. 9 in. in diameter and from 17 ft. 5.75 in. to 48 ft. 0.62 in. in height. Placed with their longitudinal center lines perpendicular to the ship when "trimmed," the tanks in general are installed in four rows approximately parallel to the ship's keel. Tops of the two outboard rows of tanks are below deck whereas the tops of the tanks in the center rows extend from 5 to 15 ft. above deck. Each of the tanks in the starboard and port rows are equipped with extended neck manways which pass through hatches for access from deckside.

In all cases the manways are installed in the center of the tank's head. Equipment on the tanks include relief valves, dip tubes with accessory items, enclosed float gages which may be observed from a companionway serving one center and one outboard row of tanks, and vapor pressuring lines equipped with special nonreturn flow-type valves. All pipe lines, except vent lines from the relief valves, are made flexible with expansion bends and loops. The relief line is equipped with expansion joints located in the run between each tank. Two 60-ft. hollow steel masts located fore and aft serve as vent stacks for the relief system. Supports for the ship's radio antenna and venting of gases are the only function of these masts.

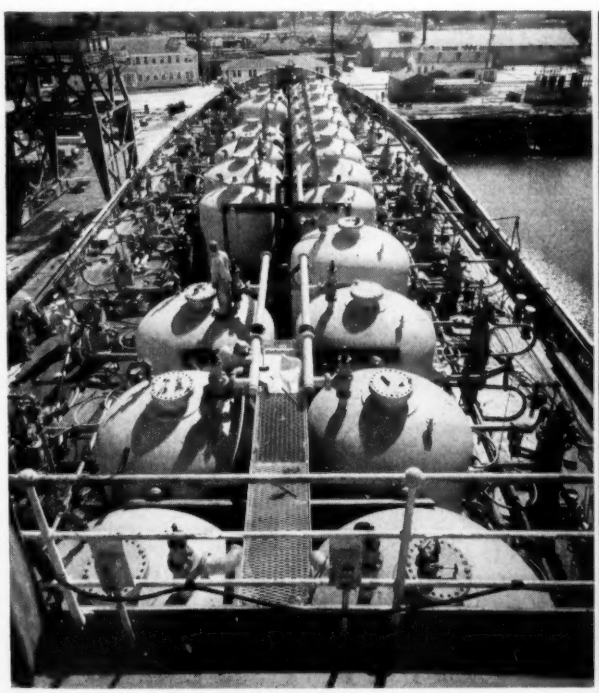
Construction Features

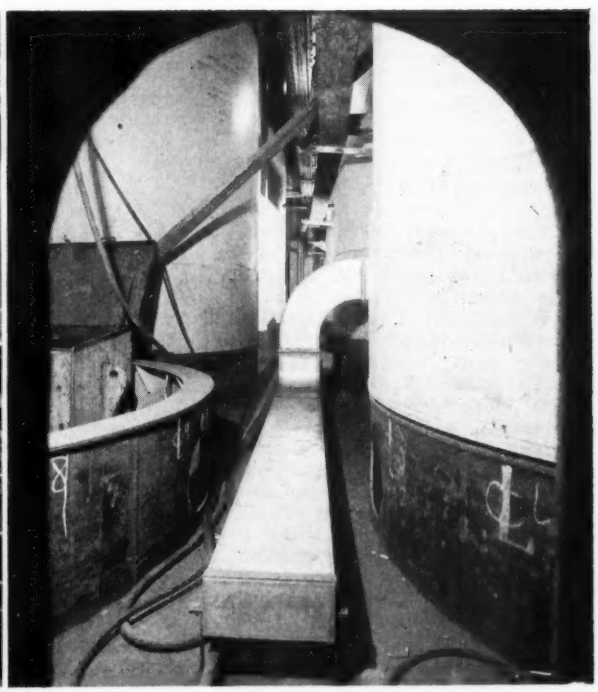
The propane containers are constructed with a short skirt which extends below its shell section about one-half the distance between the end of the shell and the bottom surface of its head. The bolting ring for this skirt is located on its inside portion opposite to the usual location for land - installed skirt - mounted equipment. Reinforcement for the bolting ring is constructed similar to the ordinary types employed for fractionator columns and the like. The base upon which the tanks rest is attached to the section of the ship known as a "tank top," which in ordinary terms could be called the ship's lowest deck. This base ring is provided with a vent hole in its side and a bolting ring at its top. When a tank was placed in position on the base or supporting ring, cast-iron spacers or chokes were installed between the two mating rings of the skirt and the base in order to bring the tank's pipe line connections to the proper elevation. Actually, these spacers are installed only for the purpose of compensating dimensional variations in the ship structure.

All tanks are supported at points along their shell height. The supporting points are at upper deck level and at intermediate deck levels between the main deck and the ship's tank bottom. Purpose of the tank-shell support is to maintain stability by transferring unbalance of loading to the ship's structure during times when the ship's movement causes the tank to be off plumb. No rigid or fixed attachment is made between tank and support at points above its base. In order to maintain minimum movement between tank and support in the plane of support, especially treated wood wedges are used. These wedges contact the tank shell at 16 points on its diameter and for a distance of some 12 to 14 in. on its height. The wedges do not hinder thermal expansion movements but at the same time the tank is held securely. A combination steel and canvas arrangement is used to make water tight the area between tank shell or manway and the circular hatchway to the main deck.

Safety measures employed in addition to standard equipment required by the U. S. Coast Guard and American Bureau of Shipping include a special venting system for each hold. The air is changed every 30 minutes. Inflammable-atmosphere detectors and remote-controlled shut-

(Continued on page 251)





View on the left, photographed during final stages of construction, shows the tank arrangement forward of the pilot house. Pressure-relief valves may be seen, atop the inboard tanks, connected to vent lines which terminate in the ship's mast-vent-stack. The photograph on the right shows the special-type tank bases which support the tanks and also the duct system for exhausting vapors from the ship's hold

The Interstate Oil Compact Commission's new secondary-recovery advisory committee: (Front) Paul D. Torrey, Houston, chairman; R. C. Earlougher, Tulsa; Don R. Knowlton, Oklahoma City; Ralph J. Schilthuis, Houston; and Dr. George H. Fancher, Austin. (Back) Don T. Andrus, Bradford, Pa., chairman, stripper-well committee; John A. Anderson, Oklahoma City; William L. Horner, Tulsa; H. C. Fowler, Bartlesville, Okla.; D. B. Taliaferro, Bartlesville; and J. P. Jones, Bradford, Pa. Absent were Fred Sehmann, Wichita Falls, Tex., and Max W. Ball, Washington

New Compact Secondary-Recovery Group Completes Organization

THE newly created secondary-recovery advisory committee of the Interstate Oil Compact Commission held its initial meeting September 30 in Oklahoma City following approval of the membership of the group by the compact executive committee.

The organization of the committee, of which Paul D. Torrey, Houston consulting engineer, is chairman, was completed with the election of J. P. Jones, Bradford, Pa., as vice chairman, and E. G. Dahlgren, of the commission's headquarters staff, as secretary. Definite plans for the work of the secondary-recovery division was considered and the work of the various members defined. A meeting of the committee sometime in November is under consideration in order to complete organization and make plans for the winter meeting of the compact December 4-6 in Oklahoma City.

The compact has shown a growing interest in secondary-recovery and particularly the conservation aspects of these operations. The research and coordinating committee recommended at the compact meeting in Dallas last December that a secondary-recovery division be organized, and the executive committee in February approved the plan with an initial appropriation of $15,000. Suggestions made at the Secondary-Recovery Forum last May in Washington were reviewed by an editorial committee, and the following definite objectives were adopted by the compact executive committee at the Great Falls, Mont., meeting in August when decision was made to set up the secondary-recovery advisory committee.

1. Encouragement of legislation permitting unitization of oil fields to enable the application of secondary-recovery methods or pressure maintenance.

2. Collection and study of current and ancient production statistics and well records in all areas having secondary recovery possibilities, together with collection and periodic publication of secondary-recovery statistics.

3. Encouragement of research by states on methods for increasing oil recovery and periodic review of all important research in progress to be based on personal visits to institutions of higher learning and to industrial and research laboratories.

4. Maintenance of contact with federal agencies having relations of various kinds with the oil and gas industry.

5. Coordination with other organizations interested in secondary-recovery work.

Hiram M. Dow, chairman of the Compact Commission, explained that the purpose is primarily to aid in coordinating and correlating all secondary-recovery activities, help in elimination of duplicate effort, and point out possible avenues for future study deemed most likely to be productive of results. The compact will seek to compile data conçerning the most effective methods as they are developed, to make such information available to all the states and industry, and to encourage expansion of research work.

Trans-Continental Amends Gas-Line Plans

WASHINGTON.—Trans-Continental Gas Pipe Line Co., Inc., Longview, Tex., has filed an amended application with the Federal Power Commission to replace its previous application requesting authorization to construct a gas pipe-line system from Texas fields to the Eastern Seaboard.

Total estimated cost of the project has been increased from $130,000,000 to $150,000,000.

Facilities proposed in the amended application include construction of a 26-in. transmission line beginning at the Rogers Lacy field near Mercedes, Tex., and extending about 1,839 miles to a New York delivery terminus; construction of 18 compressor stations with an aggregate installed capacity of 186,000 hp.; lateral lines to serve the Philadelphia and New Jersey areas, a number of gathering lines in the Texas gas fields and other miscellaneous construction.

Gas would be obtained from Rogers Lacy field, McAllen gas field, La-Blanca and San Salvador fields, all in Hidalgo County, Texas; LaGloria field, Sun field, Alice, Ben Bolt, Banderra, and other fields in Brooks and Jim Wells counties; the Sun Oil Co. property in Pledger field, Brazoria and Matagorda counties, Texas; and in Egan field in Acadia Parish, Louisiana; and from the Magnolia Petroleum Co.'s property in West Gueydan field, Vermilion Parish, Louisiana, the company said. Hearing on the application has been set to open October 27 in Washington.

Diesel Group to Hold Panel on Marine Use

The Diesel Engine Manufacturing Association will conduct a panel on "The Use of Diesel Engines in Ocean-Going Vessels" at the American Merchant Marine Conference October 16 at the Waldorf Astoria Hotel in New York.

E. J. Schwanhausser, president of the Diesel Engine Manufacturers Association, and vice president of Worthington Pump & Machinery Corp., will serve as chairman.

Cochairman is Gordon Lefebvre, vice president, Diesel Engine Manufacturers Association, and president, Cooper-Bessemer Corp.

Kane Properties Sold

The oil and gas holdings of Kane Oil Co. have been sold to H. A. McKenna, Kane, Pa., for an undisclosed amount. The properties will be operated in conjunction with McKenna's recently acquired holdings of Bo-Mac Oil & Gas Co.

A. S. M. E. Petroleum Conference Draws More Than 400

by R. B. Tuttle

HOUSTON.—Upwards of 400 engineers assembled here October 5-8 to attend the 1947 National Conference on Petroleum Mechanical Engineering. Sponsored by the petroleum committee of the American Society of Mechanical Engineers in cooperation with its South Texas section, the conference is the second held by the society since the war ended.

Devoted entirely to mechanical engineering problems of the petroleum industry, the conference was divided into 11 technical sessions for the 3-day period. Papers and discussions given in the technical sessions covered horizontally all divisions of the industry.

E. W. Jacobson, Gulf Research & Development Co. and secretary of the A.S.M.E. petroleum executive committee, and C. E. Reistle, Jr., manager, production department, Humble Oil & Refining Co. and chairman of the general arrangements committee for the Houston meeting

In the opening day's sessions, four papers were presented on materials, one on equipment, five on transportation, and two on refining. Attendance at these sessions indicated high interest in the particular subjects of hydraulics and intermingling of products given in the transportation sessions. *(Digests of the papers will appear in The Oil and Gas Journal, October 18.)*

Sessions on the second day included papers on production and transportation. Inspection trips to the Sinclair Refining Co. refinery, Hughes Tool Co. and Cameron Iron Works plants the afternoon of October 7 drew an exceptionally large attendance.

Tuesday evening at an informal banquet, the principal speaker, Beauford H. Jester, Governor of Texas, talked on "State Ownership of Lands and Resources Underlying the Marginal Sea." Referring to the recent decision of the U. S. Supreme Court in the California "tidelands" case, Jester said: "This case will, no doubt, become a potent weapon for proponents of the nationalization of the entire oil and gas industry as well as other vital natural resources and industries whose business, the portent of which are tied in with our national security and might become 'the subject of international dispute and settlement.' Oil is merely in the leadoff position in the lineup of nationalization of vital natural resources."

The three sessions Wednesday, the final day of the conference, dealt with production and equipment. During this last session there was considerable interest in the discussion of free oil-well pumping systems. During this discussion a "free pump" was described. This pump is run and also pulled hydraulically, thereby eliminating the necessity of pulling or running a string of tubing in order to change pumps.

This meeting is said to be the most outstanding one ever held and its success is attributed largely to the excellent work and support extended by executives of Humble Oil & Refining Co. Plans for the 1948 conference are now in the making.

Outstanding Oil Executives To Speak at San Antonio

Two of the petroleum industry's youngest high-ranking executives will address the Texas Mid-Continent Oil & Gas Association at its twenty-eighth annual meeting at the Gunter Hotel in San Antonio October 16-17.

Robert G. Dunlop, president of Sun Oil Co., will address the group the first day of the meeting on the industry's economic and social responsibility to the public. Sidney A. Swensrud, executive vice president of Gulf Oil Corp., Pittsburgh, will discuss the production job which faces the industry.

New developments in the oil and gas industry's research program will be reviewed by H. A. Murray, of the technical and research division, The Texas Co., New York, and W. P Gage, vice president and director, Shell Chemical Corp., San Francisco.

Other speakers include Gov. Millard F. Caldwell of Florida who will discuss ownership of the tidelands; Ernest O. Thompson, chairman of the Texas Railroad Commission, who will speak on encouragement of secondary recovery of oil from old Texas fields; Frank M. Porter, Oklahoma City, president of the Mid-Continent Oil and Gas Association; A. E. Walker, president of National Supply Co., Pittsburgh; and Dr. B. Russ, San Antonio; and Bill Pitzer, Breckenridge, Tex., operator.

Hugoton Celebrating Field's Anniversary

The twentieth anniversary of the discovery of Hugoton field of Kansas, one of the country's major natural-gas reserves, was scheduled to be celebrated October 10-11 in Hugoton, Kans., in honor of men instrumental in developing the area.

Guest speakers for the affair include Gov. Frank Carlson of Kansas; former Kansas Governor Alf Landon; B. A. Hardey, former president of the Independent Petroleum Association of America, and Jeff Robertson, of the Kansas Corporation Commission.

Plans for Topping Plant In East Texas Announced

Winnsboro Refining Co. has announced plans to build a 3,000-bbl. crude-oil topping plant at Winnsboro, in Wood County, East Texas. Mid-Continent Engineering Co. has contract for construction of the plant, which is scheduled to be in operation January 1. Cost of the plant is estimated at $200,000.

Crude oil for the refinery will be taken from the Manziel, Merigale, and Norman Paul fields of Wood County, whose aggregate production is approximately 2,000 bbl. daily. Talco Pipe Line Co. will gather and transport the oil to Mount Pleasant, Tex., from where it will be shipped by tank car. A spur railroad line is being built from Winnsboro to the 20-acre refinery site, 2 miles west of the townsite, by Louisiana & Arkansas Railway Co.

Water-Flood Groups to Meet

Peter Grandone, of the U. S. Bureau of Mines staff, Bartlesville, Okla., will discuss detection of by-passing and methods of correction at the Kansas-Oklahoma Water-Flood Operators' meeting October 15 at the Booth Hotel, Independence, Kans.

Western Shale-Oil Reserves Placed at 300 Billion Barrels

by Neil Williams

Chairmen and representatives of the oil-shale division of the Bureau of Mines at the oil-shale session of the Denver regional meeting of the Petroleum Division, A.I.M.E., included: Dr. Tell Ertl, mining engineer, Rifle, Colo.; H. R. Stewart, division manager, The Texas Co., Denver, cochairman; E. D. Gardner, chief of the oil shale division, Denver; Dr. C. E. Dobbin, United States Geological Survey, Denver, chairman; and Dr. J. D. Lankford, chemical engineer, Rifle, Colo.

DENVER.—Assurance that the extensive oil-shale deposits of northwestern Colorado, east central Utah, and southwestern Wyoming comprise an important natural resource for the production of synthetic liquid fuels of the future was given by engineers of the oil-shale division of the Bureau of Mines at the 3-day regional meeting of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers in Denver last week.

Three papers covering the work being done to determine the extent of the shale-oil reserves and to ascertain the best procedures to follow to produce the oil and convert it into marketable products were presented by the bureau's oil-shale division, headed by E. D. Gardner, Denver. The presentation provided a closing highlight for the 3-day session in view of comments made earlier in the program by E. DeGolyer, widely known Dallas geologist, that the country's domestic oil production would have to be supplemented by additional supplies from other sources to meet its present and estimated future demands.

Gustav Egloff, director of research, Universal Oil Products Co., Chicago, also had previously referred to the fact that shale oil might offer an important source of raw material to meet the nation's future needs for petroleum products if crude-oil production proved inadequate. Both DeGolyer's and Egloff's papers, as well as others on the program were summarized in the October 4 issue of The Oil and Gas Journal.

In the first of the oil-shale division's papers, Carl Belser, mining engineer, Bureau of Mines, estimated that oil-shales deposits of the three states contained at least 300,000,000,000 bbl. of oil. He pointed out that this estimate embraced only those areas in which sampled sections were available. Present available sampled sections are meager, he said, and represent only a relatively small area of known oil-shale deposits. If conditions in the remaining unsampled areas are as favorable as those in areas already tested, he speculated, reserves several times greater than the above estimates eventually may be blocked out.

Oil shales occur, Belser explained, in the Green River formation, a 3,000-ft. section of sediments laid down in the bottoms of broad, shallow water bodies during Middle Eocene time. This formation, he said, extends over areas totaling 2,592 sq. miles in northwestern Colorado, 4,680 sq. miles in east-central Utah and 9,192 sq. miles in southwestern Wyoming. The oil shales lie in several zones extending generally over the area and ranging in thickness up to more than 600 ft. Most extensive sampling and testing has been in Colorado, particularly in the Piceance Creek Basin embracing an area of 1,655 sq. miles in Rio Blanco and Garfield counties, of which an area of approximately 1,000 acres already has been blocked by sample tests. There, oil content in samples taken has ranged from 15 to more than 30 gal. per ton of shale.

Colorado Has Major Portion

Shale-oil reserves in Colorado represent approximately nine-tenths of the total estimate, Belser said. Utah is credited with 33,000,000,000 bbl. and Wyoming with 2,560,000,000 bbl. So far the oil content of at least 50 per cent of the Green River formation in Utah and 90 per cent in Wyoming is unknown and is not included in the estimates for those states. Belser pointed out that so far sampled sections available average only 1 for every 1,150 miles of Green River formation in Wyoming, 195 square miles in Utah, and 39 square miles in Colorado.

Dr. Tell Ertl, another mining engineer with the Bureau of Mines at Rifle, Colo., where experimental oil-shale mining and oil-recovery operations are being carried on, discussed the problems encountered and the procedure being followed in mining the shale and transporting it to the retorts for extraction of the oil. Initially, he said, 2 miles of road had to be constructed from the main highway from Rifle to the camp site established at the base of the high cliff where the shale bed outcrops, and an additional 8 miles of difficult zig-zag road up the face of the cliff to the mine portal. Also, electric power lines and a water supply had to be provided. The mine, he explained, extends horizontally, at present about 900 ft., into the shale zone, where provision of adequate ventilation was a major item. The shale, he said, is extremely tough and hard to break, crush and handle. It is blasted by drill holes, and the broken pieces scooped up by mechanical shovels into trucks in which it is hauled to the mine entrance where the processing facilities are located.

Processing operations were described by Dr. J. D. Lankford, chemical engineer for the Bureau of Mines at Rifle. The shale first is crushed and screened, he said, and then conveyed to the top of the retort, heated by hot air and a recycle of hot gases. The oil is passed from the retort as vapor, which then is condensed and charged to the fractionating columns. The initial plant has been in operation since last May, and within the past week, he announced, ground was broken for installation of a small thermal cracking unit.

Shale oil, he pointed out, is unlike petroleum in most respects and more resembles coal tar. It is a black viscous, gum-forming product with a high pour point (about 60° F.) Viscosity runs around 200 seconds. Gasoline recovered from it has an octane rating of below 60, which, he said, probably would limit its use to the production only of motor fuel, leaving aviation gasoline to be supplied by natural petroleums. No kerosene can be made, he said, but a good fuel oil is turned out. A complete laboratory is maintained at the plant site for testing and study of processing results, and a pilot plant at Laramie, Wyo.

Offshore-Drilling Papers Feature Tulsa A. I. M. E. Meeting

by Kenneth B. Barnes

A RECORD attendance is a good possibility before the Petroleum Division of the American Institute of Mining and Metallurgical Engineers ends its October 8-10 sessions at the Mayo Hotel in Tulsa. Advance registration started on Tuesday and the following 3-day meeting is bringing petroleum engineers from many oil areas to hear the 15-paper technical program.

General chairman for the Tulsa meeting, one of the largest of its kind this year, is Lloyd E. Elkins, Stanolind Oil & Gas Co., and the various committees have scheduled a reception, banquet, and dance at the Tulsa Club and numerous activities and entertainment for the guests and visitors. High spots of the material prepared for the technical sessions follow:

A long-time goal for petroleum engineers has been to determine the efficiency of gas and water as primary agents for displacing oil, under laboratory condtions in which capillary phenomena were predominant. Toward this goal, Henry J. Welge, Carter Oil Co., Tulsa, in reporting on "Displacement of Oil from Porous Media by Water or Gas," has devised laboratory apparatus which evaluates maximum displacement of oil from cores. Welge believes the laboratory experimental maximum represents the upper limit for actual reservoir recovery. The cores he used contained interstitial brine as well as oil. Experiments were run to determine the comparative effect of varying the properties of the fluids used. Little effect was noted on the maximum displacement. This observation, he found, made it unnecessary to use fluids in their exact reservoir conditions. Consequently, the displacements were run at near-atmospheric pressure in Pyrex glass equipment, using stripped crude oils. Evidence was given that the results correctly indicate the maximum recovery obtainable, by the capillary mechanism used, from that section of the reservoir from which the core was taken.

C. R. Holmgren, research department, Stanolind Oil & Gas Co., Tulsa, gave five conclusions on gas and water-drive experimental work: (1) Greater ultimate recovery of oil may be obtained by higher pressure gradients (although other considerations indicate that this conclusion might be different when no saturation gradient is present); (2) the volume of gas required to produce a given quantity of oil decreases as the pressure gradient decreases, when the core contains connate water (for the range investigated in a constant-pressure-gradient gas drive); (3) the water input rate and the resulting pressure gradient, during a water drive at low gas saturation, has no discernible effect on the final oil saturation of the core (for the range investigated); (4) the presence of a relatively high initial gas saturation in the core before water drive results in a slightly lower final oil saturation than in the case where no initial gas is present; (5) maintenance of initial gas saturation by gas injection together with an increase in water saturation by water input results in lower final oil saturation. A large consolidated sand core was used in the tests.

New Computing Methods

Recent studies on the flow of fluids through porous media have provided new methods for computing flow under turbulent conditions. The report, "A Radial Turbulent Flow Formula," by Jack R. Elenbaas and Donald L. Katz, of the University of Michigan, was initiated to investigate pressure-drop computations for flow through porous sands and gas wells, and analyze present-day back-pressure tests. Although laminar flow of gas exists in the producing formation under normal flow rates, turbulent flow does take place adjacent to the well bore. As the flow rate is increased, turbulent flow exists further and further into the producing formation. To calculate a complete back-pressure curve for relatively deep wells without resorting to extrapolation of curves, a radial turbulent-flow formula was developed. This permits computation of pressure drop for radial flow in gas wells whether the flow is laminar, turbulent, or partially both. Using the formula, Elenbaas and Katz have calculated and analyzed a complete back-pressure curve by a comparison with existing curves. They also develop a procedure for computing permeability of the porous media when the porosity, sphericity, and average particle diameter are known.

Speaking on "Phase Relations of a Gas-Condensate Fluid at Low Temperatures Including the Critical State," C. K. Eilerts, V. L. Barr, N. B. Mullens and Betty Hanna of the U. S. Bureau of Mines, report that using a windowed cell, they have determined the specific volumes and liquid: gas ratios of a natural gas and four mixtures of condensate with the gas at temperature in the range —65° to 100° F. Critical pressures and temperatures of each of the five mixtures were measured. Measured values of the critical pressures of the mixtures investigated, they say, averaged more than 100 per cent higher than pressures computed by additive methods.

Past engineering calculations and predictions on gas reserves were computed to actual production results in "A Critical Review of Methods Used in the Estimation of Natural Gas," by Henry J. Gruy and Jack A. Crichton, of DeGolyer & MacNaughton, Dallas. The review brought forth both the advantages and qualifications involved in each of the different estimation methods, and pointed out the conditions necessary for improving natural-gas reserve estimates.

Successful Engineering

In "Elements of Success in Engineering," Herman H. Kaveler, Phillips Petroleum Corp., Bartlesville, gave a straightforward A-B-C listing of the essentials of the petroleum engineer in doing a good job. Stressed were the modern elements of successful engineering and importance of realistically meeting present-day industrial demands. In "Stresses About the Bore Hole of a Deep Well," by A. Dale Topping and A. J. Miles, Missouri School of Mines and Metallurgy, conditions brought about by opening up a formation by drill hole were detailed.

Papers dealing with the engineering and construction involved in offshore drilling feature a part of the meeting. One of these was "Mechanics of Wave Action on Structures" by Walter H. Munk, Scripps Institution of Oceanography, La Jolla, Calif. Three others were "Engineering Characteristics of the Gulf Coast Continental Shelf," by M. B. Willey and C. L. Graves, J. Ray McDermott & Co., Harvey, La.; "Important Considerations in Marine Construction," by Frederic R. Harris and H. G. Knox, Frederic R. Harris, Inc., New York; and "Planning a Multiple-Well Directional-Drilling Program for Offshore Locations," by Gordon Jackson and J. B. Murdoch, Jr., Eastman Oil Well Survey Co., Denver. *(Portions of these offshore drilling papers will be featured as separate articles in next week's issue of The Oil and Gas Journal).*

For a number of years progressive water-flood operators have needed methods for measuring the foot-by-foot water-intake rates in water-injection wells. They have wanted to diagnose unfavorable water distribution in various strata, and to eval-

(Continued on page 242)

WASHINGTON WATCHING

BY HENRY D. RALPH

Antitrust Policy Test

WASHINGTON.— Thurman Arnold's trust-busting plan was on trial in the federal District Court last week during the argument on a routine motion in the omnibus "Mother Hubbard" antitrust suit against the American Petroleum Institute and all major oil companies.

Back in 1940 the then assistant attorney general was swinging right and left against big-business "monopolies" and "conspiracies," and, against the better judgment of older hands in the antitrust division, he filed this suit charging the majors with doing all kinds of things to stifle competition and crowd out independents. The case was shelved during the war and since then Arnold's successors have been content to let it hang over the industry's head until a single defendant, Sun Oil Co., demanded that the Department of Justice answer a list of interrogatories specifying just how Sun had committed the alleged misdeeds. The department asked the court to dismiss the motion.

Technically the argument last week was over federal-court rules for pretrial procedure, but actually it was a test of Arnold's theory of mass indictment of an entire industry.

Sun Oil produced its top legal talent, the venerable George Wharton Pepper, of Philadelphia, and the normally routine motions court was packed with local lawyers gathered to hear this dean of the American bar. The department's attorney, James R. Browning, stuck strictly to the book, citing technical reasons why specific interrogatories should not be answered.

The Department's Arguments

Sun's questions, Browning told the court, would impede rather than aid a fair, speedy, and inexpensive trial; they seek disclosure of the most minute details of the government's case; they put a harassing burden on the Justice Department attorneys; they seek to obtain the product of the government's preparation for trial; and they are irrevalent, immaterial, and objectionable on various legal grounds. He said the answers would require sifting through evidence gathered for 15 years and now filling 238 file drawers in the antitrust division and an unknown quantity of material stored away in the National Archives, and that the work involved for this one of the 225 defendants in the case is out of proportion to Sun's importance in the alleged conspiracy.

George Wharton Pepper took a different tack. This is the most far-reaching and comprehensive antitrust suit in his 47 years at the bar, he told the court, and if the request for answers to the interrogatories is not granted, it will defeat the intent of federal court rules designed to prevent such "wilderness cases" and "trials in the dark." Sun, along with 365 other oil companies (now reduced to 225) is charged with conspiring to do dozens of different illegal things and it is the basic right of a defendant to know the specific charges against him, he insisted.

"This suit has been pending for 7 years; when is the Government going to get down to business and prepare for trial?" Pepper asked the court. The generalized charges of the government's complaint and the equally generalized denials of the other defendants constitute no triable issue, he said, and no proper trial will ever be possible unless the issues are defined and limited. The Government must disclose its specific charges against Sun eventually so why not now? he asked.

With rich irony, Pepper pointed out that the Government charges Sun with working hand-in-glove with other major oil companies but when Sun "in accordance with its traditional method of doing business" attempts to go its own way in preparing its defense it is criticized by the Government for not taking common action with the other defendants.

A Diminishing Staff

THE petroleum staff of the Department of State is shrinking to relative insignificance as a result of resignations and budget cuts.

John A. Loftus, chief of the Petroleum Division, is resigning November 1 because of poor health and will take a part-time teaching position with the School of Advanced International Studies. It is unlikely that he will be replaced immediately.

Charles Rayner has already resigned as petroleum adviser to the State Department, and this position is expected to be abolished. The post was created by former Secretary Hull early in the war and was conceived as a staff job to assist in policy planning in connection with war problems and negotiation of the Anglo-American petroleum treaty. At that time there was no Petroleum Division in the department. The division was created later to handle routine operations in connection with petroleum problems abroad and to handle information reports from petroleum attaches. The original plan was to build the staff up to 8 or 10 men, but budget cuts have reduced it to less than half a dozen.

Rayner expects to remain in Washington and is considering an offer to become associated with an American oil company having foreign interests. He has spent most of his life in the oil industry, much of it in the Far East with the old Standard Oil Co. of New York.

A Successor for Ball

THE report that Max Ball would resign as director of the Interior Department's Oil and Gas Division as of November 1 and be succeeded by William J. Murray, member of the Texas Railroad Commission, has been denied by all concerned *(see story, page 45)*.

The report sprang from the related facts that Ball is anxious to leave government service and that he has been canvassing state agencies, among other sources, for likely candidates for additions to his staff. Muray, however, has only recently risen to membership of the Texas body and is currently deeply engrossed in a gas-conservation program in that state.

Ball is adhering to his determination to leave OGD and return to the practice of geology as soon as he has the division organized as a going concern and has a suitable successor lined up. The first part of this self-imposed assignment is nearly completed, he feels, but none of his potential nominees for director is willing to consider the appointment at this time. Meanwhile, Ball is still searching for the one or two additional men on his staff for which funds were finally appropriated.

Government Simplification

SOME long-range improvements in the oil industry's relationships with the federal Government should result eventually from the Herbert Hoover commission on simplification and economy in federal administration.

However, the commission will not make its report until January 1949—after the next presidential election—and new legislation will be required after that. The ex-President heads a 12-member body created by Congress with the endorsement of President Truman and an appropriation of

$750,000. It is charged with making searching and nonpolitical inquiry into the constant growth and complexity of federal agencies, the burden imposed on citizens in routine relations with the Government, federal encroachment on state rights, overlapping of jurisdiction among independent agencies, and similar problems.

The oft-quoted statement that there are some 30 federal agencies having something or other to do with the oil and gas industry will be one of the matters before the Hoover group, and it may be hoped that this study will result in more tangible results than previous attempts to reorganize the Government.

However, there is little prospect that much will be done to affect the Oil and Gas Division of the Interior Department. This small unit is steadily carving a niche for itself as a purely staff function to assist the score or more of other agencies and keep them from getting crosswise with each other. Its strength comes from its weakness; that is, its complete lack of any authority. Gradually the other agencies are learning that OGD does not covet their functions and wants no operating duties of any sort. As a result, the cooperation from other agencies is increasing constantly, and divergence of their respective policies and programs can be expected to diminish and general government efficiency to improve. The Hoover commission might well take a look at OGD as a pattern for possible application elsewhere in our sprawling bureaucacy.

California's Viewpoint

A TERRIFYING volume of litigation must be threshed through lower courts before the Supreme Court can make its final decree in the famous "tidelands" case, the State of California suggests in a brief opposing the Justice Department's draft of a proposed decree.

In its decision last June that the federal Government rather than California owns the 3-mile coastal belt and the oil under it, the Supreme Court asked the parties to submit suggested forms of the decree by September 15. California submitted none and says that none is possible at this time. The court begins its fall term this week and may soon pass on this point as well as on California's petition for reconsideration of the entire decision.

Pointing out that municipalities which have obtained tideland grants from the state and hundreds of private parties which have occupied these lands are not parties to the case before the Supreme Court, the state says that no decree can be binding on them and therefore any action by the court now would be meaningless. The brief suggests that the rights of every individual claimant will have to be litigated before the matter can be settled.

The state's principal contention is that the court simply said that the federal Government has dominion over the strip of marginal sea and that the court has no power to say how the Government shall exercise this dominion. This question, says the state, is one for Congress alone. First, says the brief, Congress must write definitions of such terms as "low tide mark," "bays," "harbors," and "inland waters," and must also determine what is to be done about people now making use of the federal ocean beyond these state-owned areas. Following this there must be much litigation to apply these standards and only when such cases come to the Supreme Court can the court do anything about them, declares the California brief.

Salvage Difficulties

THE Government is having as much trouble getting rid of Canol property as it had in building the ill-fated northern Canada oil project.

Last spring it got bids for the pipe line between Norman Wells and Whitehorse, but the high bidder failed to go through with the deal, so the State Department's Foreign Liquidation Commission attempted to negotiate a sale. It thought it had a deal with the U. S. Truck Sales Co. for $700,000, but this concern abandoned the plan and forfeited its $35,000 down payment. Then it negotiated with Kulka Steel Equipment Co., Alliance, Ohio, and Frank O'Sullivan, Lethbridge, Alta., but they also dropped out.

Now the FLC has taken a down payment of $45,000 from the L. B. Foster Co., Pittsburgh, and Albert & Davidson Corp., New York, and is awaiting the attorney general's approval of the contract. Meanwhile, the purchasers have already sent crews into Canada in the hope of salvaging at least part of the pipe before winter. If the deal is completed they will pay another $408,000 at once and the balance of the total $700,000 in 6 months. The purchase includes 577 miles of 4 and 6-in. pipe, pumping stations, and much equipment along the right-of-way, which originally cost the Army some $9,000,000. Any salvaged materials may be reimported into this country prior to March 1, 1948.

A.I.Ch.E. Meeting Set

The 1-day Oklahoma sectional meeting of the American Institute of Chemical Engineers October 11 at Bartlesville will include a total of eight reports to be given at the equipment, technical, and evening sessions of the meeting.

Deep Water Flooding Planned for Gulf Coast

HOUSTON.—Secondary recovery by water flooding will be employed in one of its deepest applications in the Texas Gulf Coast at Joe's Lake field, Tyler County.

American Republics Corp. and Houston Oil Co. of Texas, joint operators of the field, have been granted a permit by the Texas Railroad Commission to water flood the field's second sand reservoir at 7,700 ft. in the Wilcox formation.

The plan is to produce water from two abandoned holes in the Cockfield formation at about 5,000 ft. and inject the water into the 7,700-ft. Wilcox zone. The two Cockfield wells will produce a total of 10,000 bbl. of water daily. Further plans include the injection of any gas produced from the 7,700-ft. sand into the first Wilcox zone at 7,600 ft.

The most common type of secondary recovery employed in coastal fields is gas injection.

General Crude Oil Co. also is studying plans to water flood the 2,800-ft. sand zone in the old Esperson dome, Liberty County.

E. DeGolyer Now Making A.A.P.G. Lecture Tour

Dr. E. DeGolyer, internationally known geologist, is making a speaking tour of local geological societies under auspices of the distinguished lecturer committee of the American Association of Petroleum Geologists.

His subject is "History of Oil Prospecting," dealing with the development of geological theories on the accumulation of oil, and is the fruit of a considerable amount of historical research. He will make a total of 30 talks within a 45-day period, the longest speaking schedule ever booked by the distinguished lecture committee.

Texmass Buys Manziel's Producing Properties

Texmass Petroleum Co. has purchased properties in Merigale and Norman-Paul fields of Wood County, East Texas, from Bobby Manziel, Tyler independent, for a reported $3,000,000.

The properties have 34 producing wells with 2,500 bbl. daily production. Also included in the sale was the Manziel gathering system which connects with the Talco Pipe Line Co. trunk.

It is estimated 25 additional wells will be required to prove all the 2,700 acres. Of the producing wells 23 are in Merigale and 11 in Norman-Paul field.

PERSONALS

Gunness Appointed Research Manager

DR. R. C. GUNNESS has been promoted to manager of the research department of Standard Oil Co. (Ind.). A graduate of the Massachusetts State College, he received his doctor's degree in chemical engineering from the Massachusetts Institute of Technology in 1936 where he was assistant professor in the chemical-engineering department for 2 years before joining the research staff of Standard Oil Co. (Ind.) in 1938 as a group leader.

Dr. Gunness was made associate director of research, heading the process-design and pilot-plant division of the research division of the research department in 1945.

He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

W. F. Burt, vice president in charge of manufacturing; **J. C. Case,** vice president in charge of production; and **C. F. Beatty,** executive in charge of industrial relations, directors of Socony-Vacuum Oil Co., Inc., were guests of **J. L. Latimer,** president, Magnolia Petroleum Co., Dallas, for a few days en route to Beaumont, Tex., where they will participate in a gathering of manufacturing representatives from the various refineries of Socony-Vacuum and affiliates. The meetings will begin October 15. Plans have been made for the Socony-Vacuum executives to visit various oil fields of the Southwest, including drilling operations in the Gulf of Mexico, and certain areas of construction work in connection with the 20-in. crude-oil pipe line being built from Corsicana, Tex., to Patoka, Ill., by Magnolia Pipe Line Co.

Harry C. Boyd-Snee, former Wichita oil editor recently associated with the Standard Oil Co. (Ind.) crude-oil purchasing department in Wichita, has been placed in charge of the Houston office of Stanolind Oil Purchasing Co. He succeeds **John N. Backus,** who resigned. **Glenn L. Shoemaker** has recently joined the company as field scout.

J. R. Fanshawe, assistant division geologist with General Petroleum Corp., has accepted a position as division geologist with Seaboard Oil Co. of Delaware.

Harry G. Davis, Bogota representative of Colombian Gulf Oil Co., who has been in the United States on vacation, has returned to Colombia.

J. C. FLANAGAN

John C. Flanagan, vice president and general manager of the Texas operating division of United Gas Corp., has been promoted to vice president and general manager of the division to succeed **J. V. Strange** who has retired. Flanagan joined the company in 1929. He served as assistant to the president from 1930 to 1940 at Houston. In 1940 he moved to Shreveport to serve in the same capacity. He was elected as vice president of United Gas Corp. and appointed as assistant general manager of the operating division in 1946 and again returned to Houston.

Rex E. Rader, formerly area petroleum engineer, Stanolind Oil & Gas Co., North Texas-New Mexico division, at Fort Worth, has been named head of the section of estimation and forecasting of reserves for Stanolind Oil Purchasing Co. His new headquarters are in Tulsa. **Julian Samuel,** petroleum engineer for Stanolind, has been transferred from Fort Worth to the administrative staff in Tulsa.

Lynn K. Lee, former division geologist, has been named assistant to the manager, in charge of exploration, for Pure Oil Co., Texas producing division, Fort Worth. **J. L. Morris,** chief of exploration, and **K. A. Mygdal,** chief of development geology, will assume Lee's former duties as division geologist.

Dr. T. H. Rogers, Standard Oil Co. (Ind.), has been promoted to director of research. He has been active in research on gasoline, distillate fuels, and motor oils since joining the company in 1922. He was made associate director of research in 1938.

Christy Payne, Jr., sales manager and director of Peoples Natural Gas Co., Pittsburgh, and vice president of an affiliate, New York State Natural Gas Corp., has been elected vice president of Peoples Natural Gas Co. He will supervise all leasing of lands for drilling, gas purchases, distribution, sales, and advertising.

W. F. Bowser, chief geologist for Sunray Oil Corp., has resigned to join R. W. Rine Drilling Co. in Wichita.

Dr. D. L. Katz, professor in charge of chemical engineering at the University of Michigan, has arrived in Regina, Sask., to make a survey of natural-gas producing areas of Saskatchewan for the provincial government.

J. M. Foster and **W. R. Tierce** have been promoted from assistant to maintenance foremen for Shell Pipe Line Corp. Foster moves to Odessa from Eunice, Tex.; Tierce, from Goldsmith to Odessa, Tex.

Joe S. Peerson, Eola field geologist for Standard Oil Co. of Ohio, has resigned. **S. C. Maples, Jr.,** has succeeded him. Other changes in Ohio Standard are: **Donald W. Heil,** technical service engineer, has been transferred to Latonia (Ky.) refinery as process engineer; and **K. L. Shull,** group leader and head of the tech-service laboratory at the No. 1 refinery, has been promoted to chief chemist at the control laboratory in Lima, Ohio. He will be replaced by **John Partch** from the research department.

W. J. Coppoc has been transferred from Port Arthur, Tex., to the Beacon (N. Y.) laboratory of The Texas Co. as assistant supervisor of the grease research department. Other changes include: **Robert H. Perry,** who has recently joined the grease department as chemical engineer; **William M. Ward,** chemist, of the research department, has been granted leave of absence to do work at Ohio State University on infrared spectroscopy.

Burdick Simons has been elected to succeed **Gerald P. Peters** on the board of directors of Frontier Refining Co. of Denver.

Dean Bradley, general superintendent of Imperial Oil, Ltd.'s refinery at Sarnia since May 1, 1944, has been transferred to Toronto as manager of the operating division of the manufacturing department. He has been with the Sarnia plant since 1913 when he started as a grease packer. He has been succeeded by **Dr. L. J. Huggett,** whose previous post of superintendent will be taken by **N. W. McCrae.**

Comer Plummer, Chicago, vice president in charge of production for Pure Oil Co., last week headed a group of the company's executives on a visit to its Midland, Tex., district office and several Permian Basin oil fields. Included in the party were: **Ira Cram,** Chicago, assistant chief geologist; **R. B. Kelly,** manager, Texas producing division, Fort Worth; and **Lynn K. Lee,** assistant to the manager in charge of exploration.

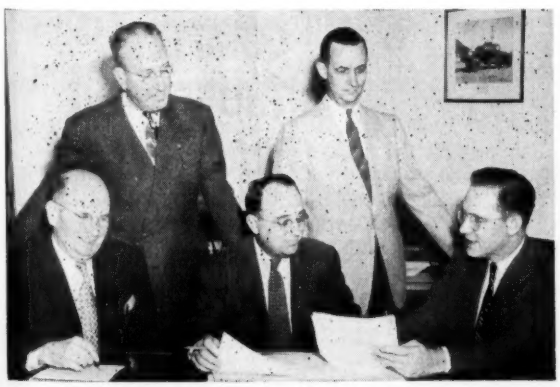
William L. Ainsworth, president of Ainsworth Brothers, Inc., Wichita, and Western Petroleum Exploration Co. and a partner in Mouser Drilling Co., has been elected vice chairman of the Kansas Petroleum Industries executive committee to succeed the late Curtis L. Henderson. **H. E. Zoller,** president of Derby Oil Co., and **J. B. Smith,** vice president of Vickers Petroleum Co., were also made members of the committee.

John O. O'Tain, senior petroleum engineer for Carter Oil Co., Tulsa, has been transferred to St. Elmo, Ill. Other recent transfers and promotions in the company include **Russell C. Curtis,** engineer, Tulsa office to Oklahoma City as assistant division engineer; **L. W. Brodie,** engineering trainee, St. Elmo, Ill., to Shreveport as a junior petroleum engineer; **Wallace W. Solter,** geological trainee, to Oklahoma City as junior geologist; **Richard W. Portes,** geological trainee to Mattoon, Ill., as junior geologist; **Trasimond A. Soileau,** roustabout, Carmi, Ill., to St. Elmo, Ill., as gasoline-plant operator; **Max C. Sons,** division engineer, Billings, Mont., to Mattoon, Ill.; **George H. Green,** assistant seismograph operator, Texarkana, Ark., to Egypt; **Robert B. Bothwell,** gravity-meter operator, Magnolia, Ark., to Venezuela; and **Leight W. Smith,** clerk No. 1, Seminole to Wilson, Okla.

Kenneth W. Cunningham, assistant regional manager for Sun Oil Co., Detroit, has been appointed chairman of the Michigan oil-industry public-relations committee.

HUGH W. FIELD

Hugh W. Field, assistant manager of the research and development department of Atlantic Refining Co. and a member of the board of directors, has succeeded **Dr. T. G. Delbridge,** noted petroleum chemist who retired as manager of the research and development department. Field has been in the research department since 1928 when he graduated from the University of Pennsylvania in chemical engineering. He was a member of the aviation-gasoline committee under the Petroleum Administration for War and was one of the four men selected to tour the United States to expedite production of aviation fuel for the armed forces.



Newly installed officers of the American Society of Safety Engineers, Tulsa chapter, are pictured here: (Seated) Lewis A. Martin, safety engineer, Sinclair Prairie Oil Co., secretary-treasurer; Ira G. Clark, safety director of Gulf Oil Corp., general chairman; and Don M. Redfoot, assistant director of industrial relations, Stanolind Pipe Line Co., vice chairman. (Standing) J. H. Savage, safety director, Mid-Continent Petroleum Corp., refining division, and Berle H. Swift, Barnsdall Oil Co., executive committee members-at-large. Executive committee members-at-large not shown in the picture are: Elmo D. Murphey, safety director, Mid-Continent Petroleum Corp., and Harry T. Markee, safety director, Phillips Petroleum Co. (Bartlesville)

Roy Pierce, field superintendent for The California Co. at Rangely, Colo., is an avowed hunting enthusiast and is acclaimed one of the best shots in northwest Colorado. Here he is showing a few of his trophies in his home at the company camp

J. A. Jackman, district superintendent, Sinclair-Wyoming Oil Co., Carmi, Ill., has been transferred to Casper, Wyo., as assistant division superintendent, Rocky Mountain area. Jackman returns to a position he held prior to being transferred to Carmi a year and a half ago. He is being succeeded at Carmi by **C. N. Goodell,** formerly foreman of the Henderson (Ky.) district. **Al Crary,** foreman of the Carmi district, has been transferred to Henderson to succeed Goodell.

E. J. LeRoi, general foreman of the catalytic-cracking department at Standard Oil Co. of New Jersey's refinery at Baton Rouge, La., has been assigned to the chemical technical-service department. Other changes made as a part of the company's program of shifting supervising personnel to broaden experience, include: **G. A. Stein, Jr.,** general foreman of the polymerization department, to general foreman of catalytic cracking; **N. F. Black,** general foreman of the butadiene and extraction department, to general foreman of the butyl plant and given charge of chemical-products utilities; **A. G. Meakin,** general foreman of the utilities department, to assistant superintendent of the utilities and light-ends division; **J. T. O'Brien,** general foreman of chemical products utilities department, to general foreman of the petroleum utilities department; **G. T. Piercy,** crude-oil coordinator in the refinery crude and marketing department, to head of that department; **Calvin Cooper,** engineer in Division 4, to assistant head of the maintenance and construction divi-

XUM

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THIS IS the most complete V-belt drive reference book ever published. It contains:

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SOLVES 90% OF ALL V-BELT DRIVE SELECTION PROBLEMS

Texrope Pre-Engineered stock drives tables have been worked out in a complete range of speeds, for horsepowers from 1 to 150. These tables show, in one place, the correct drive for any requirement. Each is the *one best drive* for the job, as pre-engineered by the finest V-belt engineering staff in the world.

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Every Pre-Engineered drive selection is made up of regular Texrope stock items. No special-order equipment is required. You can't make the mistake of buying a larger, more expensive drive than you really need, or of installing an underpowered drive that will be costly in performance and maintenance. Texrope Pre-Engineered drive selections are the *best* engineered drives — in low first cost — in performance—in reduced maintenance.

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Copies of this new manual have been sent to many Texrope users and dealers. If you have not received one, write for Texbook No. 20P40. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2249

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— sheaves in a full range of sizes, grooves.

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Exact variations in speed, stationary or motion control.

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Speed variations up to 375% at the turn of a crank.

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PERSONALS

sion in charge of mechanical crafts; **H. T. Wicker,** general foreman of the meter and instrument department, to division engineer in Division 2; and **N. B. Greely,** maintenance and construction engineer, to general foreman of the meter and instrument department.

Two new officers of Vickers Petroleum Co., Inc., Wichita, are **James J. Brown,** vice president, and **M. C. Lyons,** secretary-treasurer and a director. Their promotion followed the election of **John S. Wertz** as president of the company succeeding the late C. L. Henderson.

J. J. BROWN

M. C. LYONS

Ed Keeler, formerly petroleum engineer for Continental Oil Co., has joined Magnolia Petroleum Co., Dallas, as petroleum engineer in charge of proration matters covering 12 states.

Dr. Vincent C. Illing, of London, widely known geologist, is now traveling in the United States. He will go to South America and Trinidad before returning to England. **L. V. Illing** his son, has joined the staff of Seismograph Service Corp., Tulsa.

Durwood O. Wilkes, former assistant head of the maintenance and construction division of Standard Oil Co. of New Jersey's refinery at Baton Rouge, La., has joined Creole Petroleum Corp. in Maracaibo, Venezuela. He will work with the refinery construction forces as an assistant superintendent.

Joseph Lichtenstein, associated with Foster Wheeler Corp. for 18 years, has left that firm and established an organization specializing in the design and application of pumps, cooling towers, and diffusional equipment. Offices are at 123 William Street, New York.

SHIFTS—

W. B. Ewing, superintendent, Humble Oil & Refining Co., Grand Saline to Van, Tex.; **R. L. Mills,** superintendent, Humble Oil & Refining Co., Dickinson to Sugarland, Tex.; **V. O. Harris,** superintendent, Humble Oil & Refining Co., Grand Saline, Tex., to Harvey, La.; **Lincoln H. Riley,** superintendent, Humble Oil & Refining Co., Natchez to Fayette, Miss.; **J. D. Exner,** superintendent, Humble Oil & Refining Co., Anaco to Wichita, Falls, Tex.

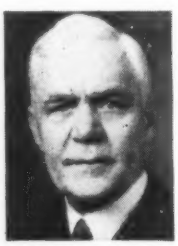
J. D. Ball, superintendent, Humble Oil & Refining Co., Santa Elena to Corpus Christi; **Frank Bass,** superintendent, Humble Oil & Refining Co., Corpus Christi to Encino, Tex.; **M. A. Mills,** foreman, Humble Oil & Refining Co., Refugio to Luling, Tex.; **A. W. R. Luard,** foreman, Union Oil Co. of California, San Pedro to Redondo Beach, Calif.; **H. F. Nabors,** superintendent, Continental Oil Co., Cuero, Tex., to Thermopolis, Wyo.; **C. E. Dougherty,** superintendent, Richardson Oil Co., Inc., Overton to Pierce, Tex.

Glen Petrick, geologist, Stanolind Oil & Gas Co., Houston to San Antonio; **Herbert F. Poyner, Jr.,** engineer, Stanolind Oil & Gas Co., Houston to Austin; **C. N. Wheeler,** engineer, Phillips Petroleum Co., Phillips, Tex., to Shidler, Okla.; **Raymond B. Kelly, Jr.,** Humble Oil & Refining Co., engineer, New Orleans to Columbia, Miss.; **W. E. Davidson,** foreman, Cities Service Oil Co., Sulphur to Maplewood, La.; **B. B. Bradish,** geologist, Skelly Oil Co., Fort Collins, Colo., to Wichita, Kans.

C. K. Taylor, superintendent, New Mexico Asphalt & Refining Co., Craig, Colo., to West Columbia, Tex.; **Frederick F. Dueser,** engineer, Republic Natural Gas Co., Ellinswood, Kans., to Golden, Colo.; **Warren O. Johnson,** engineer, Republic Natural Gas Co., Ellinwood, Kans., to Golden, Colo.; **James R. Wilkerson,** superintendent, Sinclair Wyoming Oil Co., Bairoid, Wyo., to Yazoo City, Miss.; **Lowell E. Anderson,** engineer, Phillips Petroleum Co., Bartlesville to Tulsa.

B. C. Morrow, chemist, Phillips Petroleum Co., Bartlesville, Okla., to Florence, Ala.; **W. J. Snoddy,** engineer, Phillips Petroleum Co., Bartlesville, Okla., to Bay City, Tex., **J. H. Sidwell,** engineer, Sinclair Prarie Oil Co., Drumright, Okla., to Houston; **E. A. Coons,** engineer, Sinclair Refining Co., Chicago to Wilmington, Del.; **R. N. Harding,** foreman, The Texas Co., Hattiesburg, Miss., to Farmington, N. M.; **John E. Moore,** engineer, Standard Oil Co. of Indiana, Independence, Mo., to Goose Creek, Tex.

DEATHS



Harry A. Wallace, Sr., 74, former president and general manager of United Fuel Gas Co. and associated companies of the Charleston group of Colombia Gas & Electric Corp., died September 29 in Charleston, W. Va. Wallace began his career as a rig and tank builder during the industry's infancy. He joined Hope Natural Gas Co. in 1898 as field foreman in charge of development in West Virginia. He came to Charleston in 1912 as general superintendent of United Fuel and in 1916 he was promoted to general manager and to president in 1927. He was a past president of the West Virginia Oil and Gas Association and of the Natural Gas Association of America, later absorbed by the American Gas Association.

John Lathrop Gray, 72, retired oil-industry executive and inventor, died October 1 in Rocky Hill, Conn. He was at one time manager of Tide Water Associated Oil Co.'s refinery at Bayonne, N. J. He invented and patented the Gray chilling machine, used for wax distillates. Gray was a former director of the American Petroleum Institute, manager of the Pierce Oil Corp., vice president of Barnsdall Oil Corp., and vice president of Deep Rock Oil Corp. He retired in 1932.

Fergus S. Davis, 44, Corpus Christi, Tex., oil broker, died October 2 in Corpus Christi.

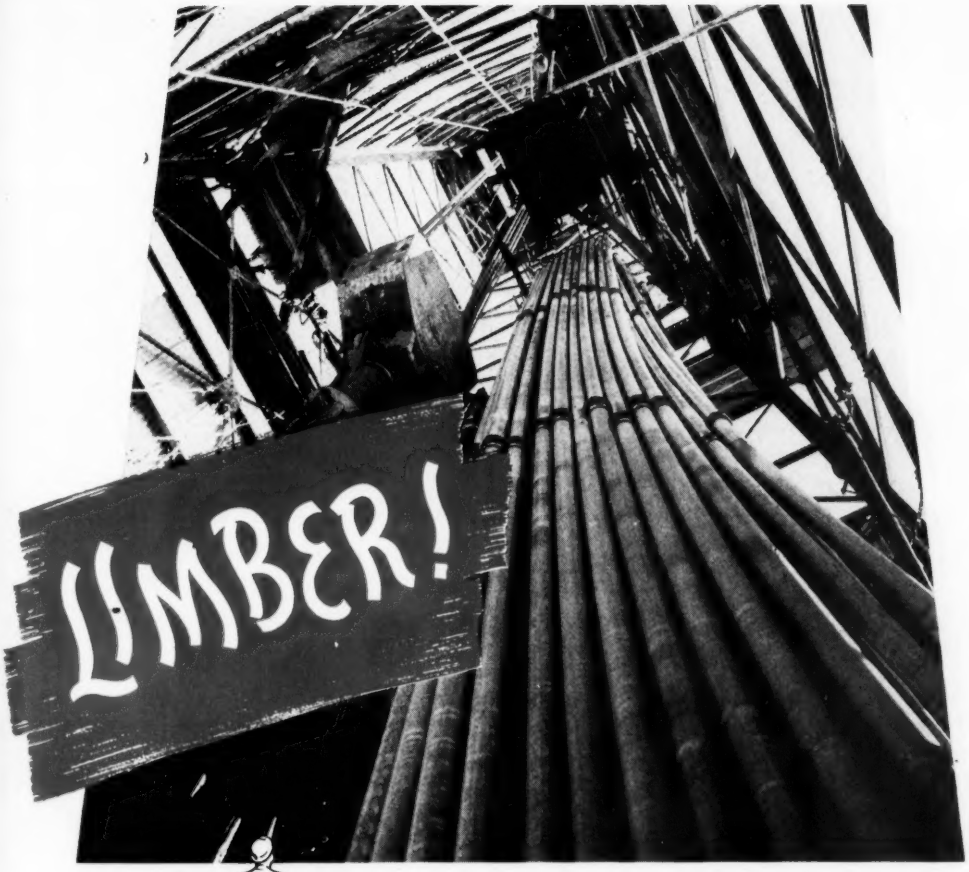
Vinson L. Finn, 51, former Tulsa oil man at one time associated with Roxana Petroleum Co., now a part of Shell Oil Co., Inc., died October 6 in McCamey, Tex.

Charles S. Jackson, former Pure Oil Co. scout at Shreveport and Jackson, Miss., died last week in Jackson.

E. B. Prince, 69, partner in Prince Brothers Drilling Co. and Prince Brothers & Gehle Drilling Co., Electra, Tex., died recently in Waxahachie, Tex.

Lewis Polston, 42, maintenance superintendent for Shell Pipe Line Corp. at Cushing, Okla., died recently in Cushing.

Frank A. Reed, 58, an associate in the budget department of Standard Oil Co. of New Jersey, died September 28 in Montclair, N. J.



That's why it needs Patterson-Ballagh Casing Protectors

Here's something you see every time a round trip is made . . . limber pipe standing in the derrick. You see it so often that you forget how limber long stands of drill pipe really are. And it's just as limber in the hole—a potential source of trouble!

As you look up in this picture you will notice the Patterson-Ballagh Lipped Casing Protectors on every joint of pipe. This operator is making sure his casing and drill pipe is 100% protected against metal-to-metal contact in the hole. The life of the drill pipe will be prolonged, the friction-less bearings will make it rotate easier, and less power will be consumed. The resulting lower torque and steady turning means faster hole, straighter hole and lower drilling costs.

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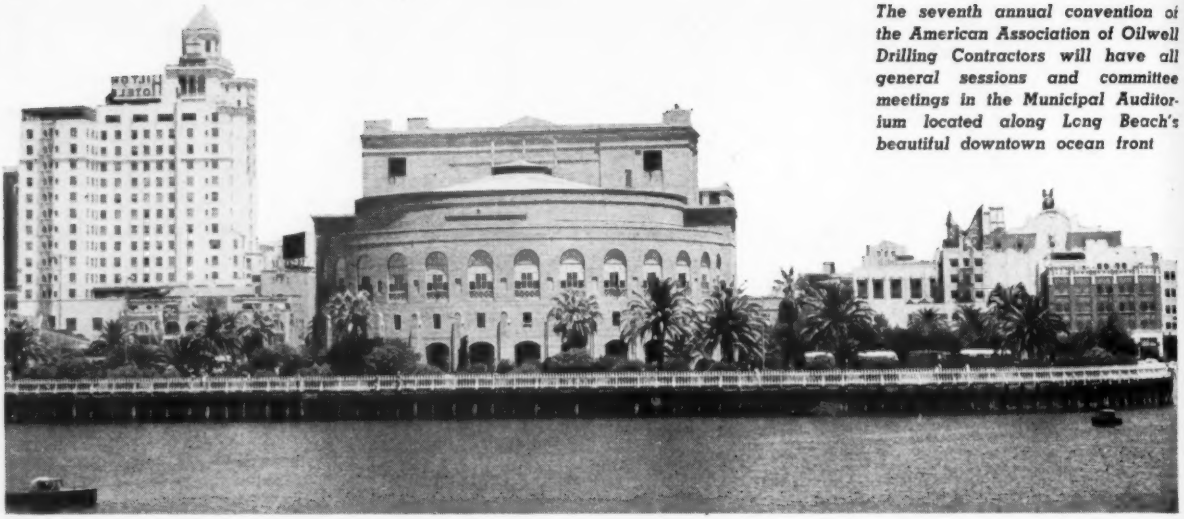


The seventh annual convention of the American Association of Oilwell Drilling Contractors will have all general sessions and committee meetings in the Municipal Auditorium located along Long Beach's beautiful downtown ocean front

LONG BEACH IS HOST CITY FOR CONVENTION

PROGRAM

MONDAY, OCTOBER 13

Morning.—Committee meetings in Long Beach Municipal Auditorium. Rotary drilling. Research and Educational, Safety and Insurance, Publications, Accounting, Nominating.

Noon.—Luncheon in Marine Room at Hilton Hotel with welcome to delegates by Mayor Burton W. Chase, of Long Beach.

Afternoon.—General session in Concert Hall, Long Beach Municipal Auditorium.

President's address—J. E. Warren, Carl B. King Drilling Co., Midland, Tex.

"Unique Provisions of Long Beach Harbor Oil Development Contracts," Irvine Smith, Long Beach City Attorney.

"Exploitation of Long Beach Harbor Oil Properties," Frank Hardesty, petroleum development engineer of Long Beach Harbor Department.

"Production Operations of Long Beach Harbor Oil Properties," John Rumbaugh, petroleum production engineer, Long Beach Harbor Department.

Tour of harbor under direction of W. R. (Frosty) Martin, chairman, Long Beach Harbor Commission.

TUESDAY, OCTOBER 14

Morning.—General session, Concert Hall.

Committee reports: Rotary Drilling, Research and Educational, Safety and Insurance, Publications, Accounting.

Noon.—Luncheon, Marine Room, Hilton Hotel.

Afternoon.—General session, Concert Hall.

"Automatic Drilliing Control," Martin E. True, Humble Oil & Refining Co., Houston.

"Effect of Hole Enlargement on Cementing and Completing Practices," Bruce Barkis and Kenneth Wright, B. & W., Inc., Long Beach.

Report of nominating committee, meeting of directors.

Evening.—Stag barbecue followed by entertainment, Lakewood Country Club.

WEDNESDAY, OCTOBER 15

Morning.—General sessions, Concert Hall.

"The Drilling Situation Today," J. D. Spalding, National Supply Co., Torrance, Calif.

"Manners of Management," John M. Forline, labor-relations consultant, Los Angeles.

Noon.—Luncheon, Marine Room, Hilton Hotel. Installation of new officers.

Afternoon.—General session, Concert Hall.

"Fundamental Considerations in the Design of Rock Bits," Wiley B. Noble, Reed Roller Bit Co., Houston.

"Telling the Facts," Reese H. Taylor, president, Union Oil Co. of California.

Evening.—Social hour, main floor, Long Beach Municipal Auditorium.

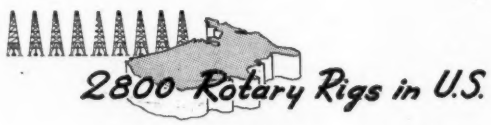
Banquet, Convention Hall, Long Beach Municipal Auditorium.

Red Skelton, master of ceremonies; brief talks by Goodwin J. Knight, lieutenant governor of California; Fred N. Howser, attorney general of California; Adm. Oscar C. Badger, Commandant, 11th Naval District.

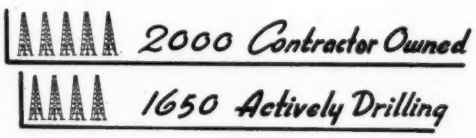
OCTOBER 13-15

Facts ABOUT THE DRILLING Contractor

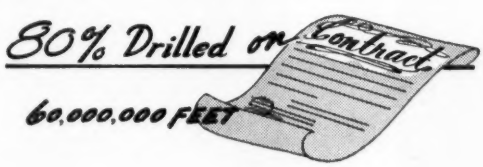
A total of 2,800 rotary rigs exist in the United States at the present time, of which 1,969 at latest report are in active operation.



Of the total rotary rigs in this country, drilling contractors own about 2,000 and an estimated 1,650 of these are now actively drilling. A.A.O.D.C. members are drilling in every major drilling area in the world at present with the exception of the U.S.S.R.



An estimated 80 per cent of all wells drilled this past year were drilled on contract. Total footage ran an estimated 60 million by contractors.

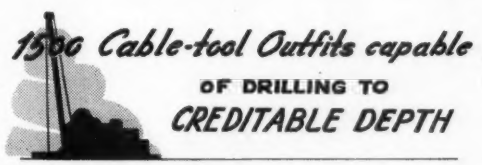


The trend toward contracting is shown most clearly in California which was the last major area to follow the trend. In recent years contractors' rigs in California have grown from less than 15 per cent of total to over 70 per cent (120 out of a total of 170).

Investment in rotary rigs by drilling contractors now totals at least 250 million dollars.

It is estimated by one source that 1,070 new rigs have been bought in the past 2 years, and 535 old rigs retired for obsolescence and wear.

Cable-tool outfits capable of drilling to creditable depths are estimated to total 1,500 in U. S. at present.



MEN WHO DIRECT THE A. A. O. D. C.

BRAD MILLS
Executive vice president, Dallas

J. E. WARREN
Carl B. King Drilling Co., Midland, president

J. Doyle Settle, Dallas, secretary

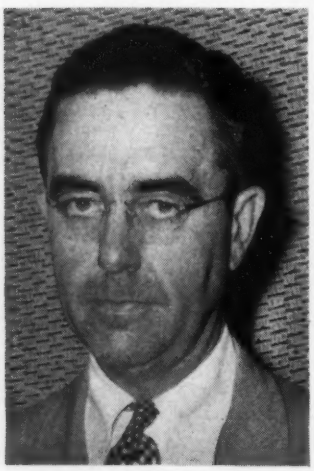
Left, top: **H. C. MILHOAN**, *Milhoan Drilling Co., Tulsa, vice president at large*

Left, bottom: **E. C. BROWN**, *Brown Drilling Co., Long Beach, vice president for California*

Right, top: **C. J. DAVIDSON**, *Davidson Drilling Co., Fort Worth, vice president for Texas and New Mexico. Also chairman, membership committee*

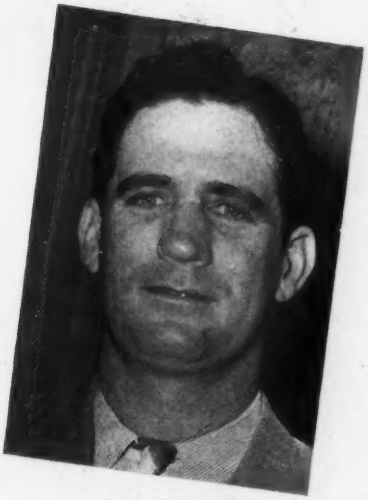
Right, bottom: **S. R. MEALY**, *Mealy-Wolf Drilling Co., Tulsa, vice president for Central Mid-Continent and Rocky Mountains*

Below: **C. J. PAINE**, *F. B. Paine Drilling Co., Dallas, treasurer*



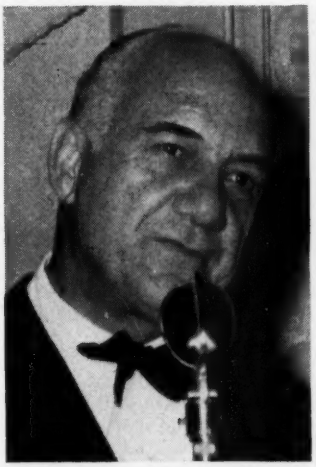
JOSEPH S. MORRIS
Allen & Morris, San Antonio, vice president for Gulf Coast

GUY B. WHITE
Delta Drilling Co., Evansville, Ind., vice president for Illinois, Michigan, Indiana, and Kentucky



E. E. PICKERING
Pickering Service Co., Houston, vice president for well servicing

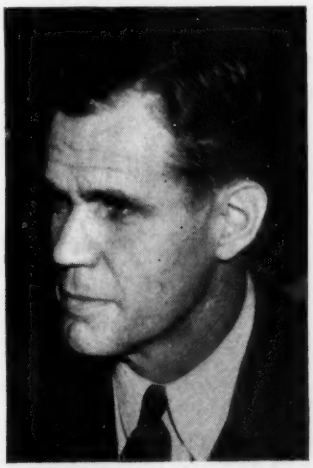
C. W. ALCORN
Falcon Seaboard Drilling Co., Houston, chairman rotary drilling methods committee



J. E. BRANTLY
Drilling & Exploration Co., Inc., Dallas, chairman publications committee

WILLIAM BROADHURST
Helmerich & Payne, Inc., Tulsa, chairman safety and insurance committee

HOWARD P. HOLMES
Two States Drilling Co., Dallas, chairman research and educational committee



ROY GUFFEY
Roy Guffey Drilling Co., Dallas, chairman rotary-drilling-equipment committee

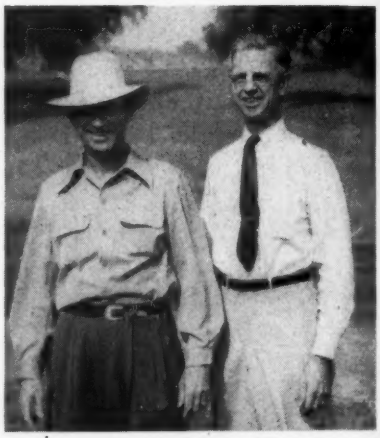
WILLIAM D. McBEE
M. J. Delaney Co., Dallas, chairman accounting committee

XUM

CALIFORNIA DRILLING CONTRACTORS

HOSTS AT ANNUAL CONVENTION

As one drilling contractor meets another next week at the A.A.O.D.C. convention at Long Beach, new friends are made—and new faces come up. Who's who? is one of the questions. Naturally the California gang are in the spotlight—it's their party—they're the hosts. Here, the Journal presents pictures of some of these prominent California contractors—some of the boys who dig 70 per cent or more of the wells on the West Coast.



D. H. BURDEN AND A. H. BELL

SAN JOAQUIN DRILLING CO.,
Los Angeles

STARTING with one rig in 1943, San Joaquin bought two more rigs in 1944, one in 1945, one in 1946, and two in 1947. There are three partners: E. E. Whipple and W. W. Cline (who has been, respectively, drilling superintendent and vice president for Rocky Mountain Drilling Co.), and J. H. Harris (who formerly had been operations manager for Owl Truck & Construction Co.). The company maintains district offices at Bakersfield, Calif., and Price, Utah. Drilling superintendents are: H. R. Allison, Howard Bowersox, R. L. Brewer, J. Hill, Orloe Davidson, Steve Thomas, Ray C. Anderson. Most of San Joaquin's drilling is on deep jobs, and in Utah the firm is at work on the deepest well ever drilled in that state—a wildcat for Pacific Western Oil Co. (Gordon Creek Unit 1) in Carbon County, now digging below 12,000 ft.

THOMAS P. PIKE DRILLING CO.,
Los Angeles

THIS contractor owns and operates in California nine strings of tools —4,500 to 12,500-ft. capacity. Two are heavy steam rigs, four are heavy-duty gas-engine-powered rigs, one is a heavy-duty diesel-powered rig, and the remaining two are light power rigs, one a diesel and the other gas-engine operated. The firm was formed in 1938 by Thomas P. Pike, a Stanford graduate with a background of experience in the oil-field supply business, with H. G. Haney as general drilling superintendent. Stanwood I. Williams, vice president, joined in 1944 after 14 years of experience in California oil-field work following his graduation from Stanford in 1930. Clyde R. Simpson became a vice president in 1947 following 12 years' experience with Bell & Loffland contractors. Simpson is also a Stanford graduate. The branch office in Bakersfield is in charge of Francis Kee, and the branch office and equipment yard at Long Beach is in charge of Harold Jordan. The company owns one producing lease in Midway Sunset field.

BELL & BURDEN, INC.,
Los Angeles

IN January 1947 this firm was formed by A. H. Bell, president, and D. H. Burden, vice president, when they purchased all drilling facilities of Continental Oil Co. in California. The original equipment consisted of five strings of tools (one portable unit, three steam rigs, and one heavy rig with diesel engines). Recently a sixth string has been added—a spark-plug rig. "Ham" Bell was formerly associated with Continental Oil for over 20 years as general superintendent of drilling and producing operations. Dewey Burden is president of Owl Truck & Construction Co. and the Owl Rock Products Co. and has contracted oil-field work for many years. "Tex" Colter, formerly of Continental, is drilling superintendent, and Jerry Murray, formerly of Kettleman North Dome Association, is office manager. A field office is maintained on Continental's Grubb lease in San Miguelito field near Ventura.

(Continued on page 158)

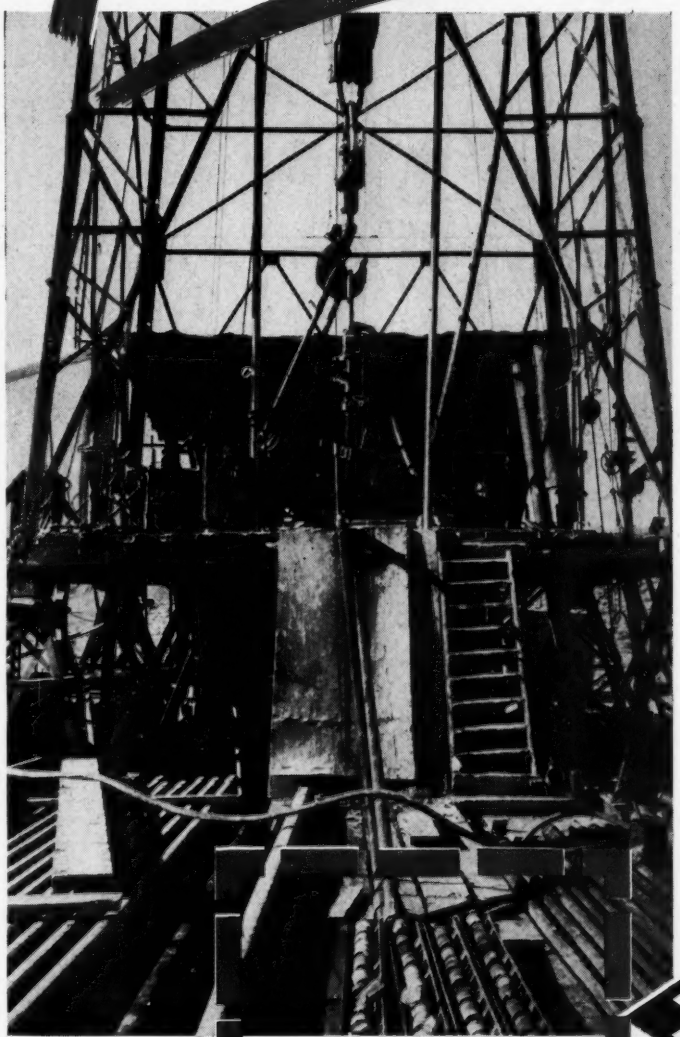
W. W. CLINE *J. H. HARRIS* *E. E. WHIPPLE*

Partners in San Joaquin Drilling Co.

T. P. PIKE *S. I. WILLIAMS* *C. R. SIMPSON*

President and vice presidents of Pike Drilling Co.

Proved PERFORMANCE



Consistently over 90% core recovery in the difficult Rangely field

Type C-6-C
6⅜"x3¾"

Christensen Diamond Core Heads and Core Barrels have drilled thousands of feet through hard formation in the Rangely field . . . continuing the outstanding performance that has cut *cost per foot* and *drilling time* for many of the leading oil companies and drilling contractors. In California . . . Colorado . . . Montana . . . Wyoming . . . Oklahoma . . . New Mexico . . . Utah . . . Christensen is adding new proof to a record of successful performance for the petroleum industry.

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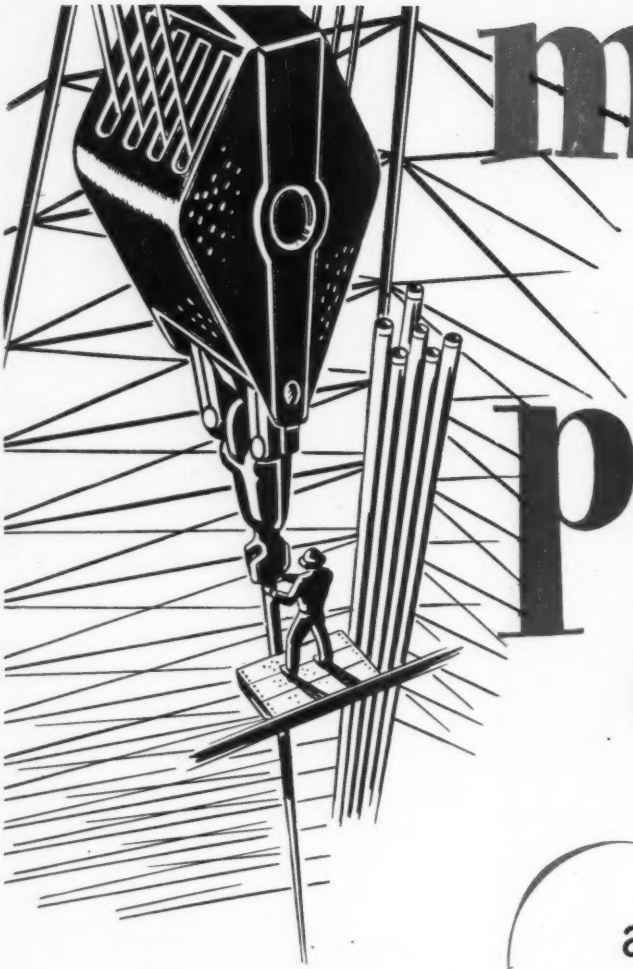

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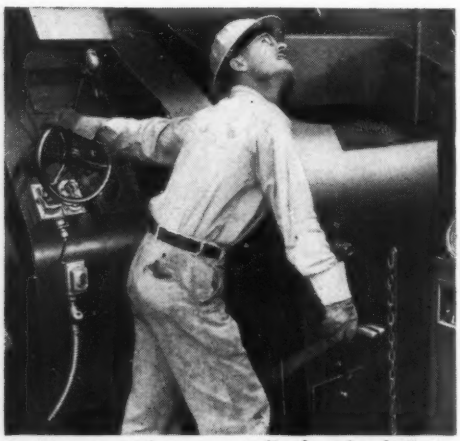

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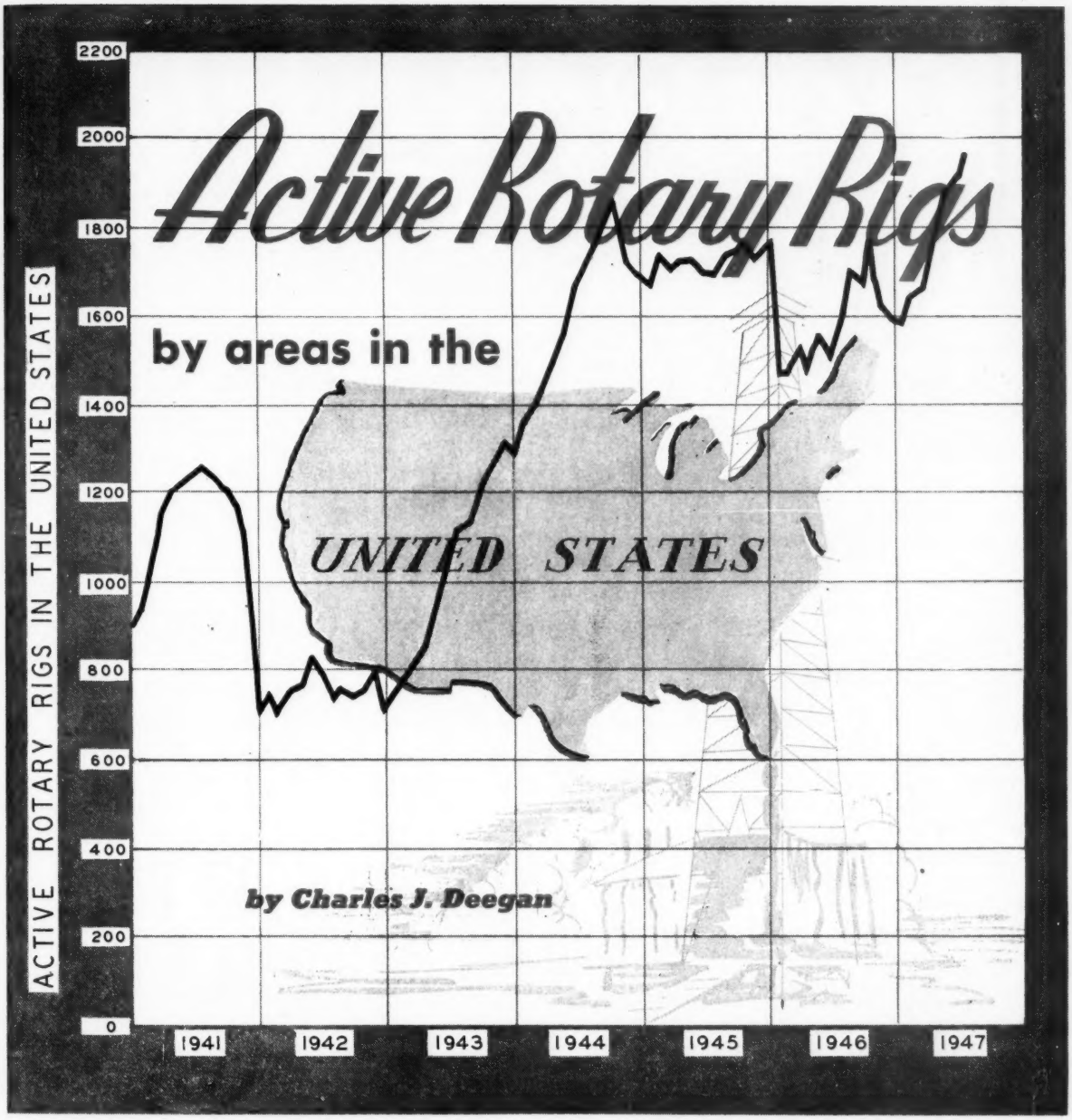

DRILLING contractors now have the greatest number of rotary rigs in active operation for many years, perhaps an all-time high. The wartime peak has been surpassed, and with far more efficient operation than was possible under war handicaps, these rigs are setting new records for completing wells.

This activity is one part of the drilling contractor's answer to the country's urgent need for more oil to meet demands during the perhaps critical period of this winter. How urgent the industry regards the problem is indicated in the large table accompanying this article.

That table, based on information supplied to The Oil and Gas Journal by operating companies, shows that the production branch of the industry intends to drill 18,395 wells during the last half of 1947. That represents an increase of 20 per cent over the same period last year, and last year was a very busy year.

This is only part of the story, however. The footage to be drilled during the last 6 months will increase 37 per cent, as compared to only 20 per cent in the number of wells. This results in part from the 3,061 wildcats scheduled, and in part from the increase in deep drilling in certain areas.

Cable-tool contractors will drill a sizable number of these wells, but the greater portion of the job will fall on the shoulders of the rotary contractors.

To meet the schedule set up by the production branch of the industry, the drilling contractors must complete an average of 707 wells per week from July 1 to December 31. During the months of July and August combined, the monthly reports (which are more complete than the weekly reports) show the contractors averaged about 750 wells per week, and September may run higher. With the trend of rotary rigs in operation still upward, and more and more rigs active each month, it is obvious that if it is possible to exceed the schedule of wells to be drilled by December 31, it will be done.

During the last half of 1946, the rotary contractors kept an average of 1,636 rigs active. The program for

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Houma, La.
Houston, Texas
Kermit, Texas
Kilgore, Texas
Laurel, Miss.
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Magnolia, Ark.
Natchez, Miss.
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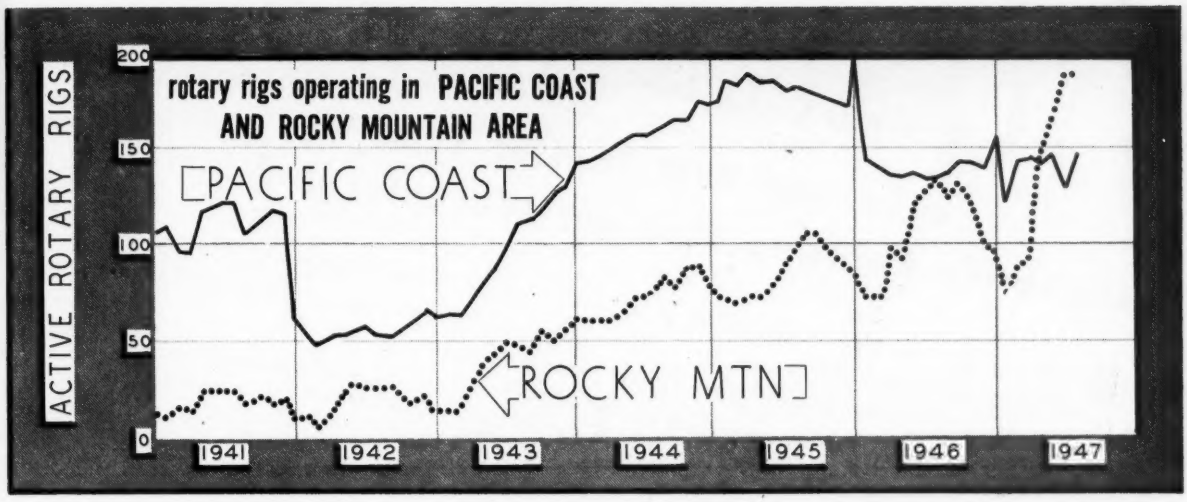


this year for the same period calls for 20 per cent more wells, and with no allowance for increased efficiency, this would seem to require 1,936 active rigs for the 6 months. However, the footage to be drilled calls for an increase of 37 per cent, and again with no allowance for increased efficiency, this would call for an average over the 6 months of 2,241 active rigs.

The average number of rigs actually active during July and August averaged 1,939, compared to a requirement of 1,963 if the requirement is estimated solely on the number of wells, and 2,241 rigs if the requirement is estimated solely on the footage scheduled. If, and it may be a big "if," the contractors are not held up by pipe shortages, the chances are that increased efficiency in drilling will make it possible to split the difference between 1,963 and 2,241 rigs. If that should happen, an average of about 2,100 active rigs over the 6-month period would be required to meet the goal.

The over-all trend indicated on the chart in the title of this article indicates that barring a sudden reversal, the 2,100 active-rig mark should be reached by the end of September. But to average that number of rigs for the entire 6-month period, the total active rigs would have to reach

DRILLING FORECAST—LAST HALF 1947 AND PER CENT CHANGE FROM LAST HALF 1946

	Forecast total wells	Change from 1946	Forecast field wells	Change from 1946	Forecast wildcat wells	Change from 1946	Forecast total footage (1,000 ft.)	Change from 1946
Alabama	8	—11%	2	—33%	6	0%	33	—20%
Arkansas	152	+64%	116	+84%	36	+12%	686	+80%
California	1,184	+33%	1,022	+37%	162	+17%	5,200	+39%
Colorado	175	+70%	142	+53%	33	+230%	1,048	+63%
Florida	12	—8%	3	+200%	9	—25%	100	+32%
Illinois	991	—22%	684	—24%	307	—19%	2,600	—21%
Indiana	288	—9%	235	—2%	53	—30%	530	—11%
Kansas	1,154	+7%	972	+7%	182	+7%	3,660	+6%
Kentucky	265	—27%	248	—18%	17	—71%	428	—29%
Louisiana	875	+19%	695	+16%	180	+34%	5,530	+32%
North	444	—1%	364	—5%	80	+29%	1,660	+3%
South	431	+50%	331	+53%	100	+39%	3,870	+49%
Michigan	597	+41%	466	+53%	131	+10%	1,256	+45%
Mississippi	303	+123%	228	+140%	75	+83%	2,445	+134%
Montana	147	—15%	127	—15%	20	—10%	300	—17%
New Mexico	387	+70%	357	+72%	30	+43%	1,670	+80%
New York	845	+14%	845	+14%	0	(*)	1,195	+13%
Ohio	646	—7%	622	—6%	24	—25%	1,850	—1%
Oklahoma	2,651	+46%	2,132	+48%	519	+42%	8,900	+64%
Pennsylvania	1,484	—20%	1,437	—22%	47	(*)	2,500	—15%
Texas	5,559	+44%	4,406	+45%	1,153	+41%	26,010	+56%
Eastern	347	+8%	251	—4%	96	+65%	1,967	+53%
North Central	1,774	+37%	1,464	+50%	310	—3%	5,330	+55%
Panhandle	362	+164%	354	+158%	8	(†)	1,348	+224%
West	1,261	+32%	1,106	+31%	155	+35%	6,515	+35%
Southwest	742	+136%	464	+166%	278	+99%	3,880	+273%
Gulf Coast	1,073	+28%	767	+17%	306	+67%	6,970	+24%
West Virginia	452	+11%	432	+6%	20	(*)	1,253	+18%
Wyoming	212	+147%	159	+140%	53	+165%	1,009	+172%
Miscellaneous	8	—58%	4	+100%	4	—77%	38	—5%
Total United States	18,395	+20%	15,334	+19%	3,061	+24%	68,241	+37%

*Wildcats not segregated in 1946. †No wildcats drilled in 1946.

Questions & Answers

about the NEW Shaffer Type 46 Combination Rotating Blow-out Preventer and Stripper

BECAUSE IT is so complete, so adaptable, so trouble-free in all types of pressure control operations, operators everywhere are asking for more information about the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper. Typical questions include . . .

"DOES IT REQUIRE SPECIAL STRINGS OF PIPE? *We like to simplify our operations and inventories as much as possible and are wondering if your unit requires flush joint or other special pipe."*

NO! The Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper requires no special drill string equipment of any kind. It packs off around *any* type of pipe—coupled, upset or flush—with equal efficiency and safety. What's more, it maintains its leak-proof seal *continuously* while any type of pipe is raised or lowered through the unit!

"WHAT OPERATIONS ARE NEEDED TO PACK OFF THE UNIT? *Pressure emergencies happen fast. What operations are required to seal-off against pressure leakage around the drill string?"*

NONE! The Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper is *always* packed off while the drill string is in the hole. No matter how sudden the pressure emergency, it can't be too fast for the Shaffer Preventer *because no operations whatever are needed to place it in operation!*

"CAN BITS AND REAMERS BE PASSED THROUGH THE UNIT *with maximum ease, safety and simplicity?"*

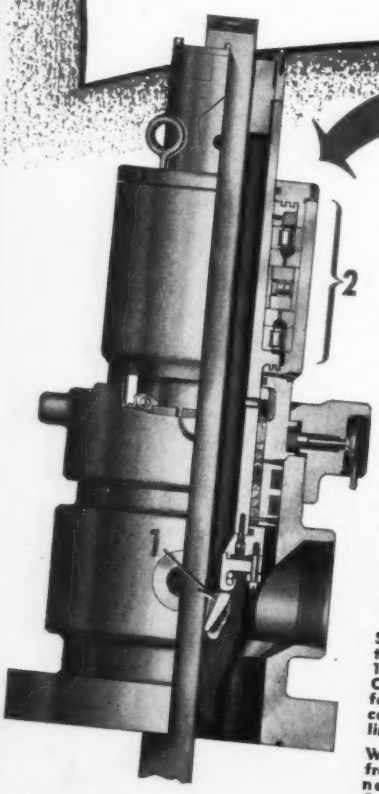
DEFINITELY YES! Just pull a latch, rotate the Bonnet 1/6th turn and the entire internal mechanism rides out on top of the bit or reamer. Simply reverse the operation when going back into the hole. It's as easy as that—*and as quick!*

"HOW ABOUT THE KELLY? *Is a special kelly needed to keep from damaging the sealing rubber?"*

NO SPECIAL KELLY IS NEEDED with the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper. You can use a square, hexagon or octagon kelly—whichever you prefer—and the *same* unit seals as effectively around each type. What's more, because the Stripper Rubber rotates *with* the kelly—not around it—there is virtually no wear on the Rubber while drilling. Cuts maintenance, assures better pack-off and a maximum of trouble-free safety!

. . . and note these features

There are many other unique advancements incorporated into the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper of which the following are typical . . .



1. EXPANDABLE STEEL BARRIER PROTECTS RUBBER. Note how the Stripper Rubber is protected by a barrier of steel latches that expands and contracts to permit normal flexure—but safeguards against extrusion or abnormal expansion.

2. ADVANCED BEARING DESIGN. Thrust and radial loads are carried on separate bearing assemblies, each specifically engineered for its particular type of service. In addition, the radial bearings are widely-spaced to provide ample resistance against wobble and gyrating loads.

These and still other unique advancements make the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper the most efficient, most versatile, most positive pressure control unit yet developed. Get all the details on this years-ahead control unit from your Shaffer representative. Or write

See pages 3454 to 3506 of the 1947 Composite Catalog for information on the complete Shaffer line.

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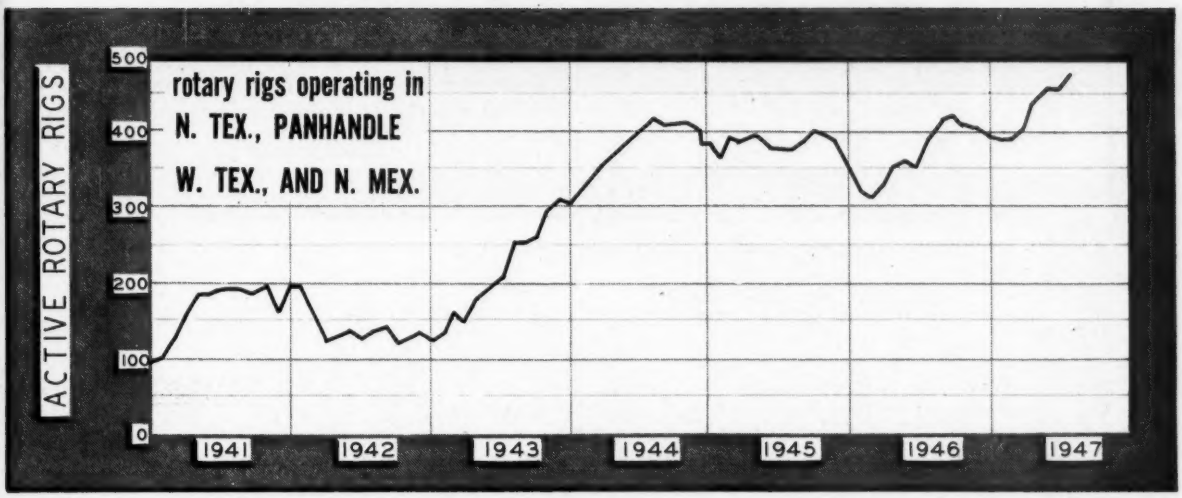


2,200 in October and hold for almost the entire remaining period. If that number of rigs is not put into service, the difference will have to be made up in increased footage efficiency by the smaller number of rigs in operation.

The large table which shows the schedule of well completions the production branch of the industry has set up as a last-half goal brings out some things that are confirmed in the charts by areas of active rotary rigs. The increases in number of wells scheduled is not distributed uniformly by geographic areas. Neither are the increases in rotary rigs in operation. In some cases this is due to changes in plans since the last-half well-completion program was established last May and June.

Pipe shortages in some spots, or availability of some kinds of pipe as against shortages of other kinds; changes in prospects for extension of certain leases, some favorable, some unfavorable, will always result in changes in plans as to the details of a scheduled drilling program.

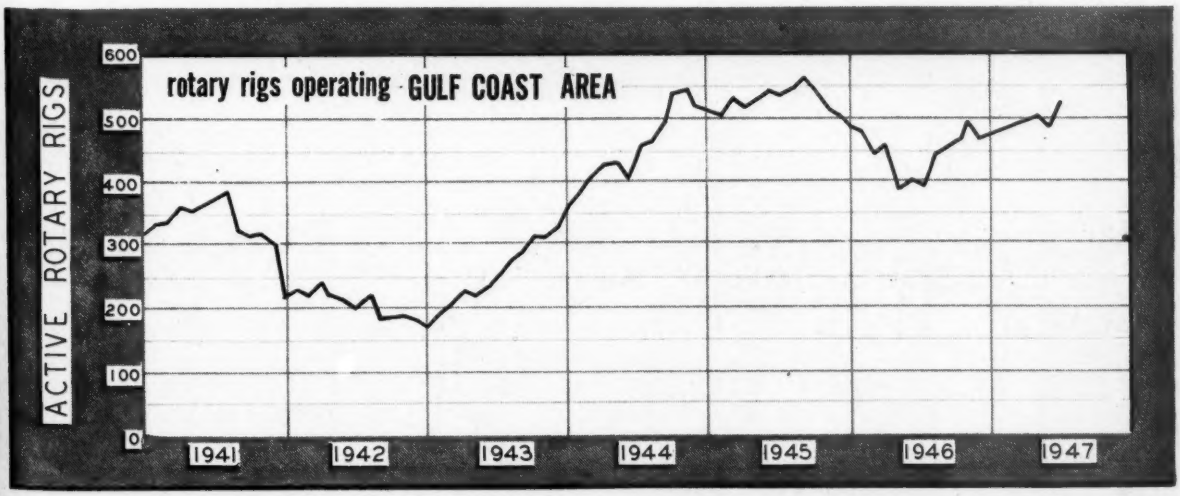
In California, the number of active rotary rigs shows no particular upward trend, whereas in the Rocky Mountain area the upward trend is noticeable. In July and August, California well completions increased only 6 per cent over the same period last year while the Rocky Mountain area was showing nearly a 28 per cent increase, with every prospect of increasing the rate of gain.

The Gulf Coast area on the other hand scheduled large increases all the way from South Louisiana to South Texas; the number of active rigs is higher than last year and going up; completions in July and August were 60 per cent higher than last year.

In general the increased number

1947 DRILLING PROGRAM BY DRILLING METHODS

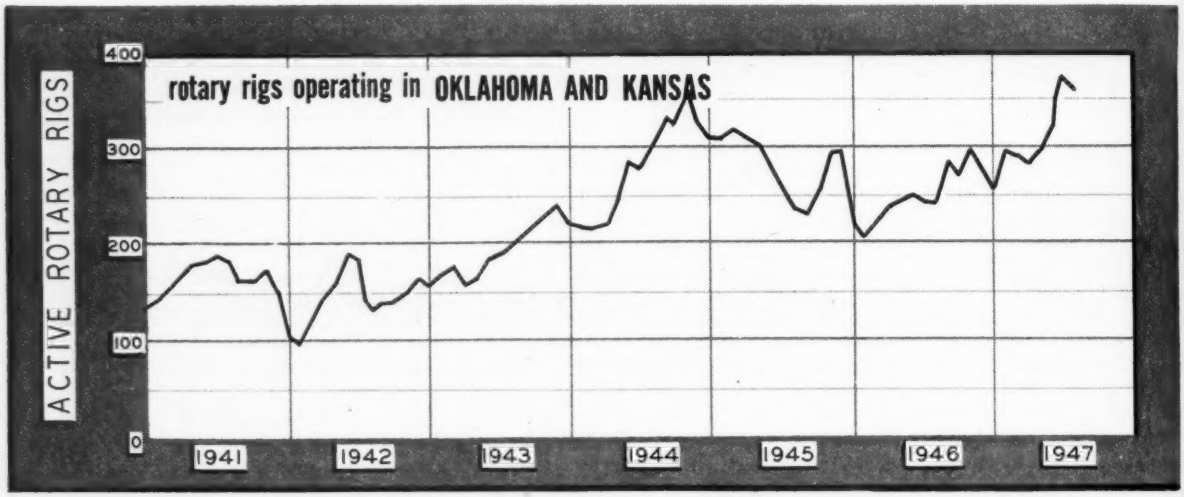
	First half actual		Last half programed	
	Rotary comp.	Cable tool comp.	Rotary comp.	Cable tool comp.
Alabama	7	0	8	0
Arkansas	136	0	152	0
California	1,011	0	1,184	0
Colorado	73	15	175	0
Florida	15	0	12	0
Illinois	821	74	920	71
Indiana	101	199	175	113
Kansas	1,099	76	1,086	68
Kentucky	211	80	172	93
Louisiana	614	0	873	2
North	318	0	442	2
South	296	0	431	0
Michigan	248	119	398	199
Mississippi	226	0	303	0
Montana	58	41	92	55
New Mexico	249	19	350	37
New York	0	803	0	845
Ohio	2	599	2	644
Oklahoma	1,798	200	2,350	301
Pennsylvania	0	1,453	0	1,484
Texas	3,954	374	5,110	449
Eastern	243	0	347	0
North Central	1,182	188	1,498	276
Panhandle	180	30	316	46
West	883	156	1,134	127
Southwest	735	0	742	0
Gulf Coast	731	0	1,073	0
West Virginia	1	394	0	452
Wyoming	81	21	176	36
Miscellaneous	3	3	6	2
Total United States	10,718	4,470	13,544	4,851

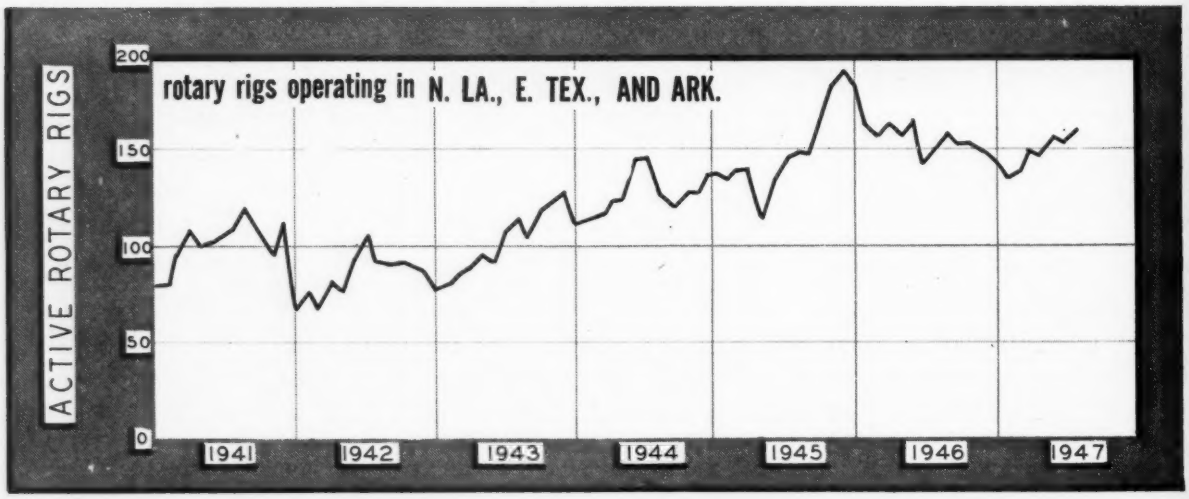


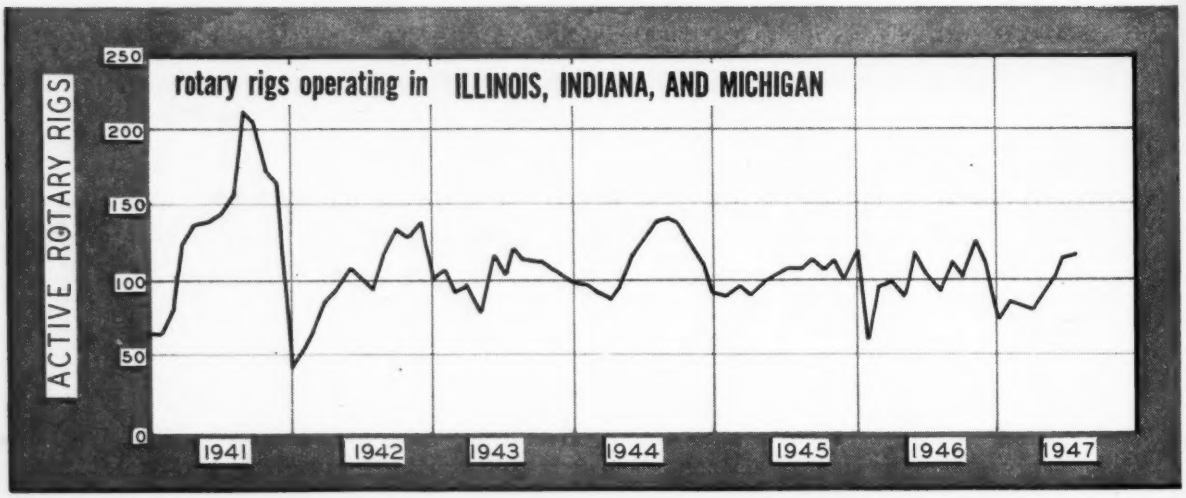
of active rigs by regions ties in pretty well with the program forecast by the production operators. Since Illinois and Indiana are grouped with Michigan in the data on active rigs, the increased activity in Michigan is masked by a lack of any exciting increases in the other two states.

Only California, Illinois, and Indiana fail to show a marked upward trend in the number of active rigs in service.

Barring bad-weather breaks from an early and severe winter, and given relief from pipe shortages, the drilling contractors give every sign at this time that they will get the wells drilled that are needed.







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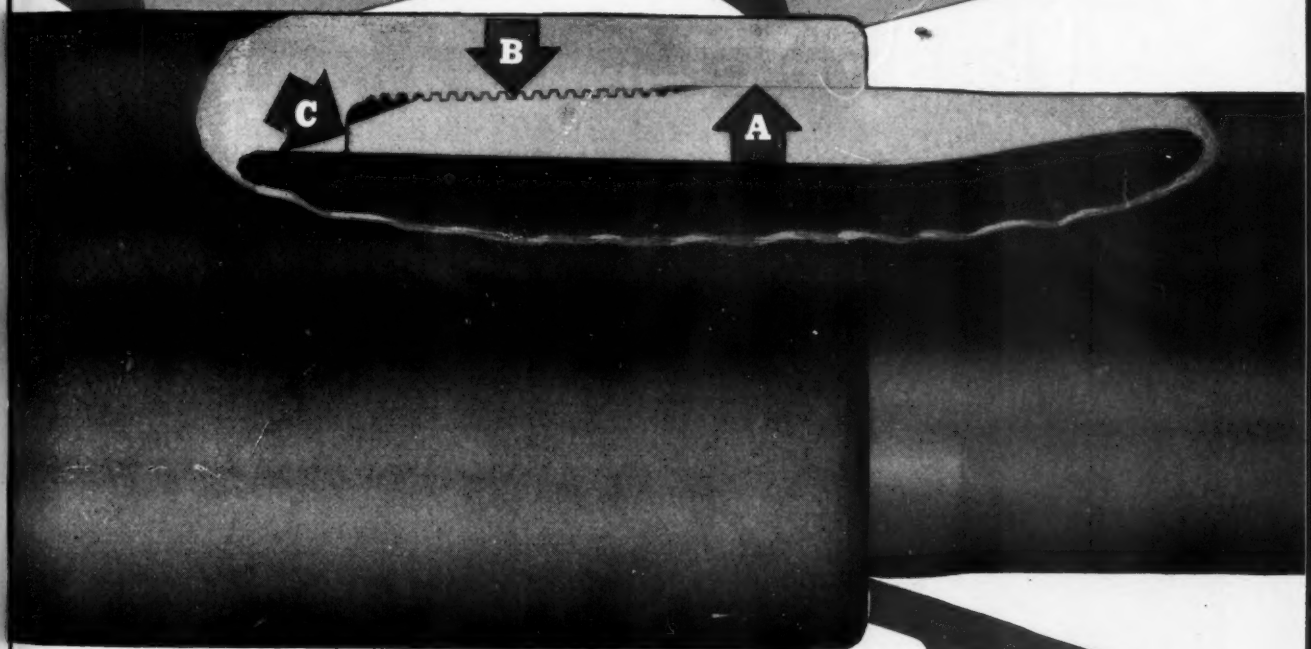

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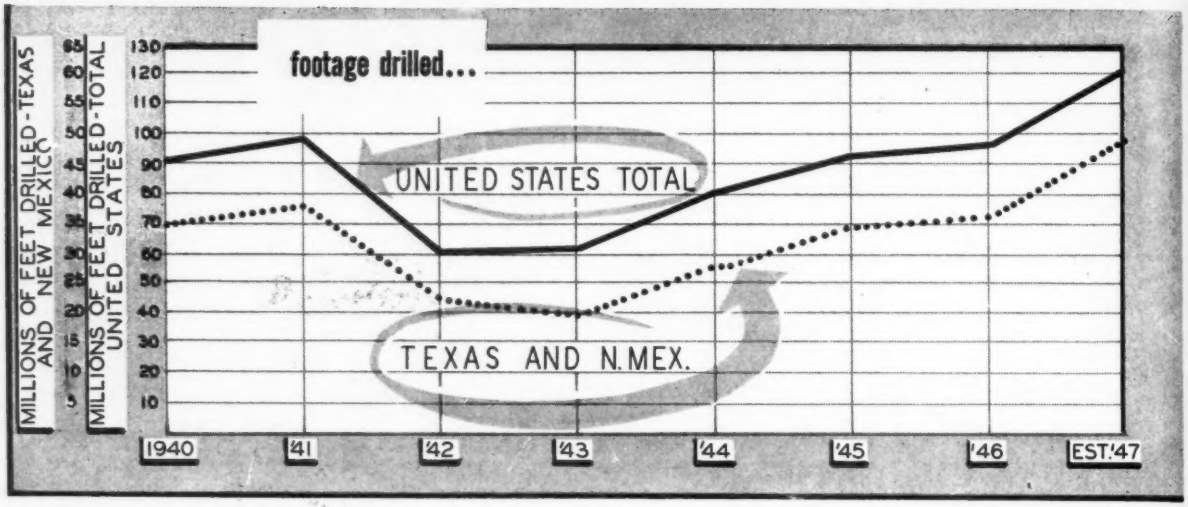


1947 Drilling Footage to Exceed All Past Records by Wide Margin

THIS year will see many new records, many new all-time highs established in the petroleum industry, but most of these new records will be compared to wartime peaks. The total footage drilled this year will be different in that respect. While it will establish a new all-time high, the record it will surpass was established in peacetime.

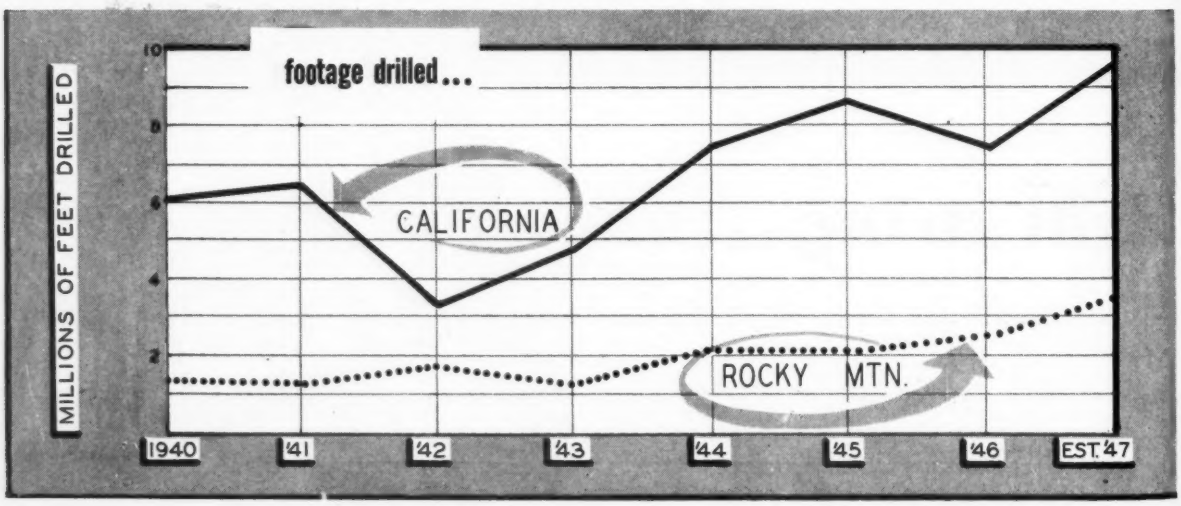
During the year 1941, the drilling branch of the industry completed almost 100 million feet of hole. Then came Pearl Harbor and the necessity of finding steel somewhere to build the greatest navy and the greatest mechanized army the world had ever seen, plus the mightiest general shipbuilding achievement in history. Despite its importance, the oil industry was asked to give up 40 per cent of its steel requirements to be diverted to the armament industries.

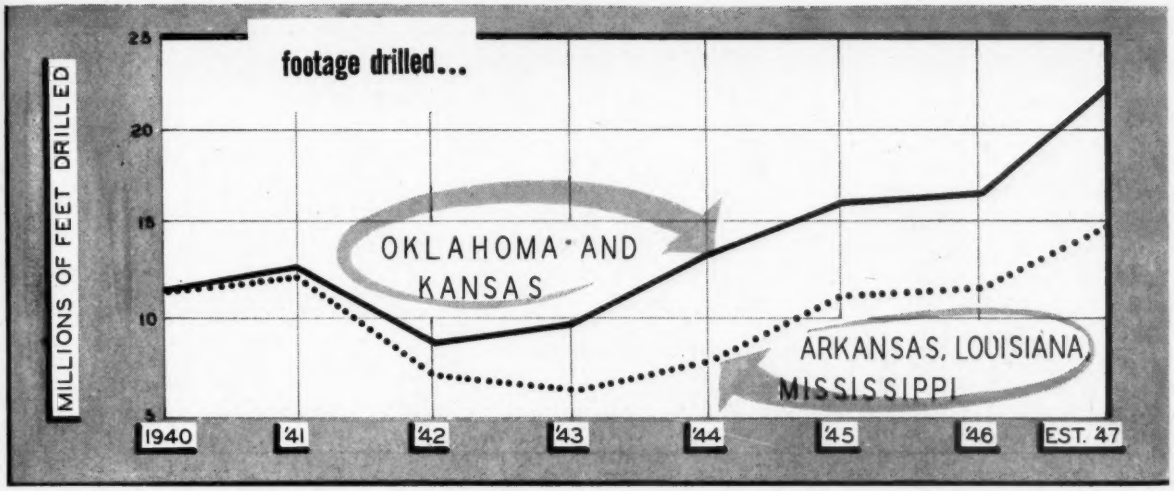
Footage drilled dropped almost exactly 40 per cent in 1942 and again in 1943, then started upward rather slowly as steel was allocated with a grudging hand to supply the oil necessary to win the war. By 1945 the urgent military needs for oil resulted in allocation of almost enough steel to equal 1941's high footage total.

In 1946, the first full postwar year, things got off to a slow start, because of the general impression that the decrease in military demand for oil could not be absorbed until millions of new automobiles and oil burners could be made and put in the hands of the public. By the time that it became apparent that estimates of civilian requirements in the postwar world were too low, it was too late to set any new footage records in drilling.

In 1947 it is clearly apparent that a new footage record is going to be established. The only question is whether the scheduled program of 25 per cent increase over last year can be met.

The operators' program calls for about 68¼ million feet of hole in the last half of this year. That program requires an average rate of 11,373,000





ft. per month. The July and August records show that slightly over 23 million feet were completed during those 2 months, for an average of 11½ million feet per month, and a small margin over the required monthly average. But this does not take into account the fact that the number of drilling rigs in active operation was steadily increasing in those months. In the remaining 4 months, there will be more rigs to pile up footage of hole than there were during the first 2 months.

Texas

Texas, of course, will dominate the footage drilled. The chart at the head of this article compares Texas and New Mexico with the total United States. New Mexico is included because the bulk of the footage is in the southeastern part of the state, and from an operating standpoint is largely an extension of the Permian basin of West Texas.

By making the scale for Texas-New Mexico just twice as large as that for the total United States, an interesting relationship can clearly be seen. If Texas-New Mexico footage was always exactly half of the United States total, the two lines would lie on top of each other. But instead the Texas-New Mexico line always falls below the total United States line, but at about the same distance each year. This means that this area, year by year, accounts for a little less than half of the total footage drilled. As long as the gap between the lines remains about the same, the Texas-New Mexico proportion of the total is staying about the same.

Year by year, from 1940 through to the estimate for 1947, the gap is about the same, with one exception. In the first full war year of 1942, the effect of the submarine campaign on tanker outlets for Texas oil resulted in that state being little harder hit than other areas. The table accompanying this article shows that New Mexico represents only a small part, about 6 per cent, of the combined total for the two states.

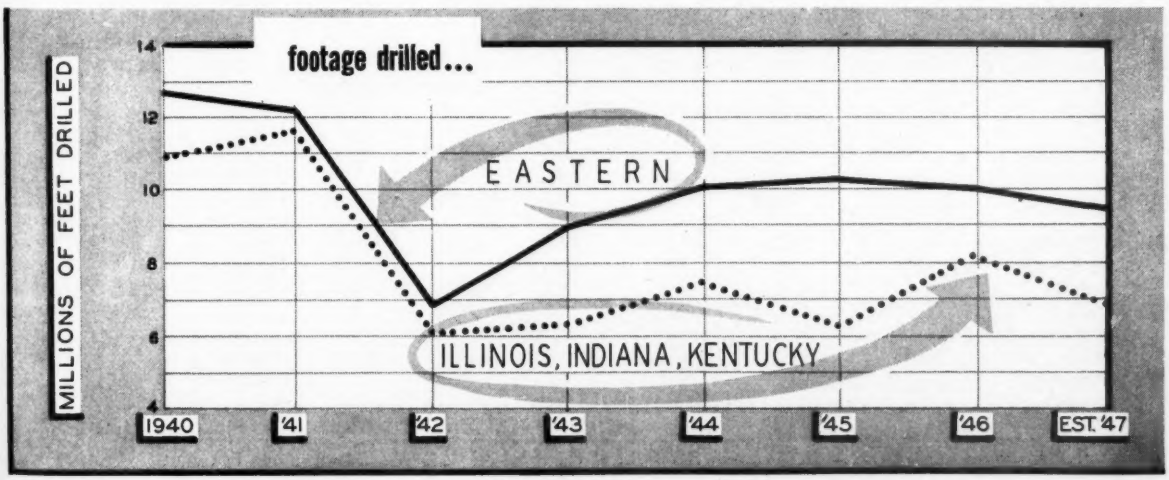
California

The charts of other areas also reveal some interesting trends. California was experiencing a heavy drilling campaign in 1945, when much of the burden of supplying the Pacific war was falling on that state. In 1946, this state, contrary to the general trend, saw a sharp drop in total footage. This probably means that California's peacetime reconversion problems, in so far as they affected the demand for new drilling, were more complex and required more time to effect than was the cast in other areas. But 1947 is seeing a sharp upturn that will undoubtedly exceed the 1945 peak.

At this time, it looks a bit doubtful whether California will reach the original very ambitious goal set by the operators for the last half. Footage totals for July and August averaged 661,000 ft. per month, whereas the operators' original program called for 867,000 ft. per month. A new record will be set, but a very sharp increase in footage for the remainder of the year will be required to reach the original goal.

Rocky Mountain

Rocky Mountain operators have scheduled an extremely heavy last-half drilling program this year, one that calls for almost double the footage in the last 6 months that was drilled in the first half. In the first half year the footage completed aver-



aged 199,000 ft. per month; the last half program calls for an average of 393,000 ft. per month.

In the month of July 253,000 ft. were completed, falling 140,000 ft. short of the required average. In August, however, the rapid increase in active rigs began to show up, a total of 348,000 ft. of hole being completed. September and October results will probably tell whether or not the footage goal will be reached, because by November and December the effect of winter, which comes early in that region, will be felt.

A lot of new rigs have gone into the Rocky Mountain region in the past few months (see chart in preceeding article on rotary rigs in operation). This will have an effect on the total footage drilled, but it also raises questions about winter operations. Rocky Mountain winter drilling is bound to be a new experience to many of these crews, and a certain amount of trouble is almost inevitable.

Oklahoma-Kansas

The chart on Oklahoma-Kansas shows that a tremendous increase in total footage is scheduled for the year 1947. For the last half year, an increase of about 25 per cent over the first-half record will be necessary to meet the year's goal. The required average for the last 6 months is 2,903,000 ft. completed per month. The July-August 2-month average was 1,902,000 ft. per month, or within 10 per cent of the required average. Barring a pipe shortage, it looks as though the drillers will make the goal here.

Louisiana-Arkansas-Mississippi

The Louisiana-Arkansas-Mississippi area (see chart), after holding steady in 1946 compared to 1945, scheduled a heavy program for 1947. The last-half program requires an average footage completed per month of 1,442,000 ft. as compared to 1,036,000 ft. per month actually completed during the first half. During July and August the drillers actually averaged 1,616,000 ft. completed per month, or substantially more than the required average. Barring a severe pipe shortage, or unexpected major developments, it looks as though drillers in this area will exceed the program established for the last 6 months of this year.

Indiana-Illinois-Kentucky

The Indiana-Illinois-Kentucky area operators seem to have been a little on the pessimistic side in establishing their 1947 drilling program, particularly that for the last half of the year. Their last-half program called for a monthly average of 593,000 ft. of completed holes. But during July and August the 2-month average was 686,000 ft. of hole completed per month.

This area will undoubtedly see more footage completed than forecast in the operators' program. In part this will be due to the fact that although no big strikes have been made, which would enable operators to see a heavy drilling program that could easily be forecast, there have been a lot of small developments, and they continue to find a few more locations here and a few more there. In part this is also due to the fact that the threatened shortage of oil is most acute in this area, and any oil found here has no transportation problem in getting to market promptly.

Eastern

The eastern area of New York-Pennsylvania-West Virginia is another region where the operators appear to have been a little pessimistic in their 1947 program, particularly for the last half of the year. Their original plans called for only 825,000 ft. per month of completed hole in the last half. During July and August they averaged 998,000 ft. per month. In this case price increases, both anticipated and actual, appear to have had their usual stimulating effect. At this rate instead of a decrease from 1946, the total for 1947 looks as though it might exceed 10 million feet and show an increase over last year.

TOTAL FOOTAGE DRILLED IN UNITED STATES—BY YEARS

(Thousands of feet)

	1940	1941	1942	1943	1944	1945	1946	1947 estimated*
Eastern (N. Y., Pa., W. Va.)	12,666	12,212	6,923	9,071	10,038	10,255	9,985	9,465
Ohio	2,110	3,354	2,875	2,493	2,730	2,689	3,402	3,610
Michigan	2,165	1,998	1,673	1,548	1,620	1,863	1,749	2,032
Indiana	801	981	736	428	581	500	1,071	1,073
Illinois	9,424	9,462	5,027	4,668	4,958	4,565	5,825	4,923
Kentucky	602	1,189	417	1,182	1,863	1,275	1,175	950
Kansas	5,714	6,353	4,795	5,808	6,194	5,877	6,556	7,448
Oklahoma	4,904	5,531	3,934	3,945	7,172	10,048	9,771	15,088
Texas total	34,534	37,268	21,064	19,030	26,621	32,495	34,352	45,667
Eastern	2,433	4,435	2,046	1,769	1,867	2,504	3,732	3,287
North Central	6,661	6,460	3,088	4,097	4,395	5,864	7,065	9,486
Panhandle	1,678	2,143	1,013	546	984	1,686	943	2,025
West	7,554	9,725	5,434	4,195	7,572	8,497	8,815	11,521
Southwest	8,703	7,525	5,073	4,805	2,312	2,254	2,138	7,614
Gulf Coast	7,505	6,980	4,410	3,618	9,491	11,690	11,599	11,734
Louisiana total	8,583	9,125	5,679	4,337	5,723	7,774	8,464	9,231
Northern	1,757	2,361	1,827	1,199	1,408	2,117	3,175	2,702
Southern	6,826	6,764	3,852	3,138	4,315	5,657	5,289	6,529
Arkansas	1,002	911	1,033	1,095	1,190	828	728	1,298
Mississippi	1,019	1,406	377	635	776	2,403	1,971	4,340
New Mexico	200	754	1,148	770	1,322	1,508	1,624	2,911
Rocky Mountain total	1,281	1,209	1,644	1,173	2,060	2,043	2,440	3,550
Colorado	87	101	123	83	207	352	1,063	1,525
Wyoming	583	496	793	557	907	967	716	1,504
Montana	611	612	728	533	946	754	661	521
California	6,130	6,511	3,359	4,793	7,527	8,671	7,509	9,639
Miscellaneous	232	268	105	302	371	346	326	301
Total United States	91,467	98,532	60,789	61,278	80,746	93,240	97,048	121,526

*Based on first-half actual figures plus operators' programs for last half 1947.

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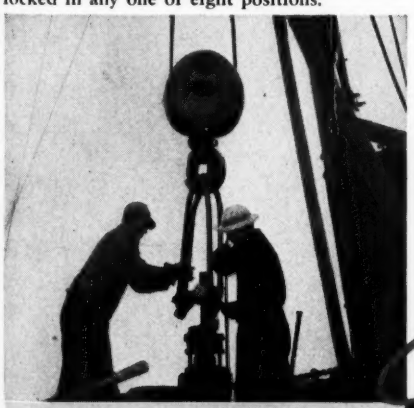
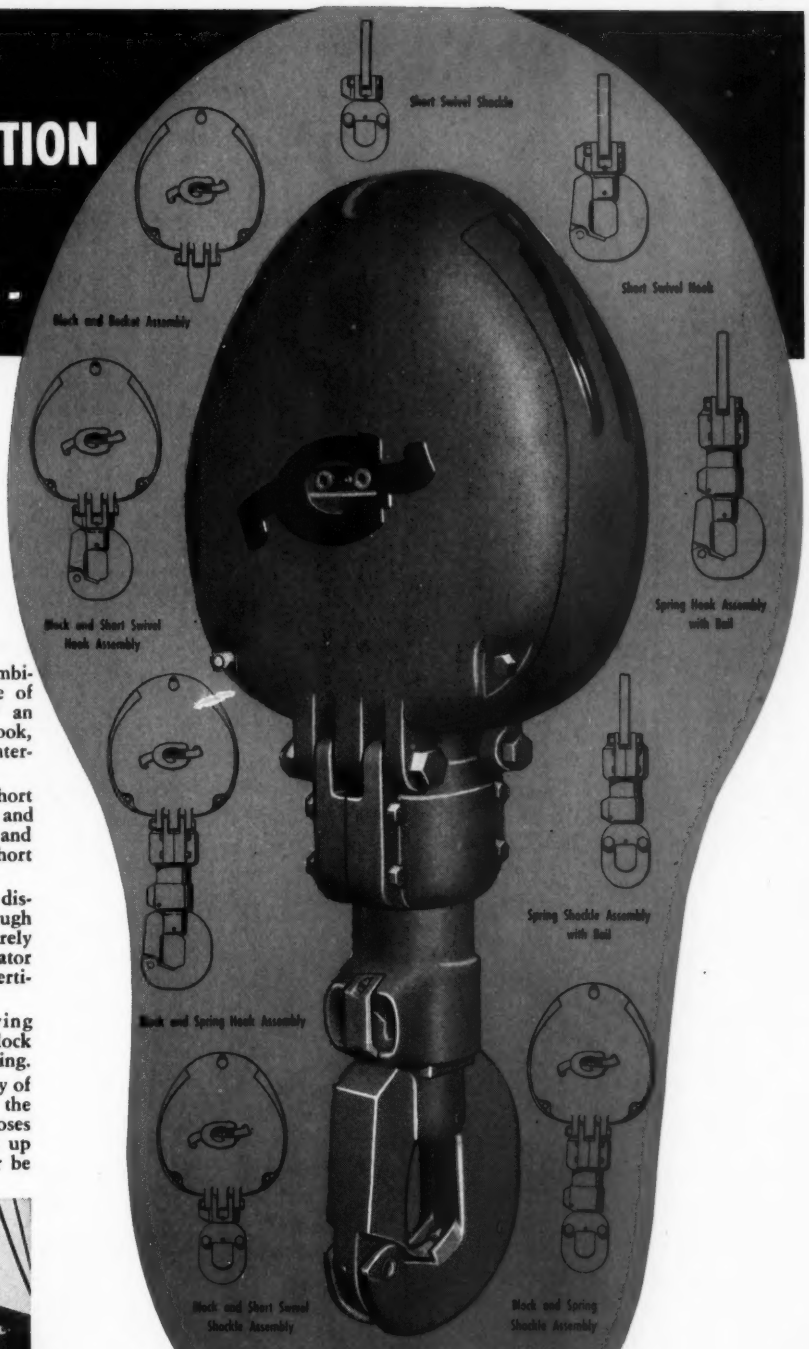
The matched assemblies give the operator short and compact hook-ups for portable rigs and short derricks . . . rigging up is simplified and added rig height is gained through its short dimensions.

Hook is designed for safety by partial load distribution to link. Link latches into hook through machined surfaces. Latch locks link securely into place and can be opened only by operator on derrick floor. Latch is not affected by vertical shock loads.

Blocks and hooks are streamlined, having no projections, assuring maximum safety. Block opens quickly for line changes or threading.

Lines are reeved into block without necessity of disconnecting hook or laying assembly on the floor. Quick opening bill (link) on hook closes and latches automatically when picking up bails. Hook may either swivel freely or be locked in any one of eight positions.




Short Swivel Shackle
Short Swivel Hook
Block and Becket Assembly
Block and Short Swivel Hook Assembly
Spring Hook Assembly with Bail
Spring Shackle Assembly with Bail
Block and Spring Hook Assembly
Block and Short Swivel Shackle Assembly
Block and Spring Shackle Assembly

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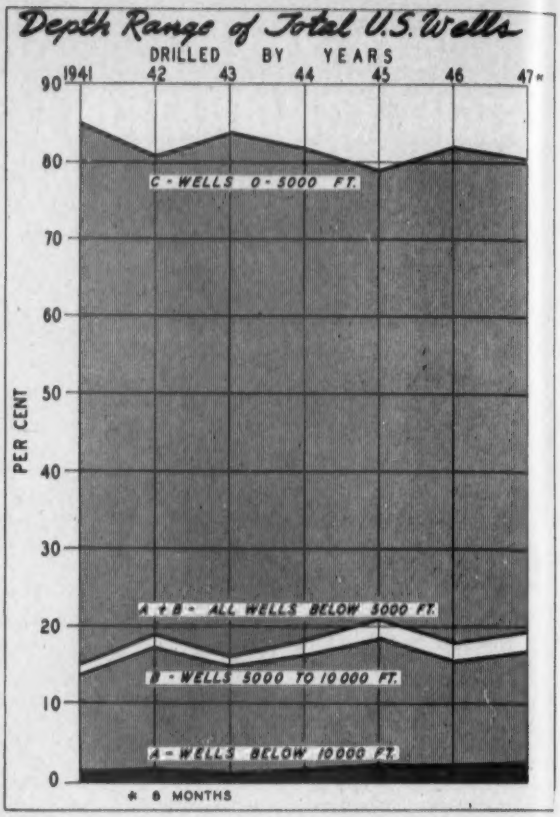
Shallow Wells Still Make Up The Contractor's Bread and Butter



Top line shows per cent of wells shallower than 5,000 ft. Line above white space in lower part of chart shows per cent of all wells deeper than 5,000 ft. Line below this white space shows per cent of wells 5,000 to 10,000 ft. Line above dark area at bottom of chart shows per cent of wells deeper than 10,000 ft.

FOUR out of every five wells completed today are less than 5,000 ft. deep, and by present-day standards are shallow wells. At least no one would classify a 5,000-ft. well as a deep test, except by purely local standards. As a matter of fact, wells are not singled out and spotlighted as really deep tests until they get below the 12,000-ft. mark, and that is only two-thirds of the present depth record of almost 18,000 ft.

Yet the drilling contractors and the drilling departments of operating producing companies find that the bulk of their activity lies in drilling wells less than 5,000 ft. deep.

The news reports of drilling tend to emphasize the deep wells; there is a great deal of discussion of the trend toward deeper drilling. This discussion enters into many phases besides actual drilling operations and is so widespread that there is danger of misleading impressions arising. There is a definite trend toward deeper drilling; year by year it is obvious. But many of the conclusions drawn from discussion of such trends are misleading.

There are two major reasons why misleading impressions arise from the discussion of trends toward deeper drilling. One is that record-breaking or near-record-breaking deep wells get far more publicity than the routine completions. Most people do not realize how wide the margin is between the depths reached by record-breaking wells and the depths drilled in the general run of wells, often even in the same region as that in which the record breaker was located.

The second reason is that deep drilling, by and large, is strictly a regional affair, and most of the deep wells are confined to a surprisingly small area. The present depth record is nearly 18,000 ft., and a long list of wells can be compiled that went beyond 12,000 ft. Yet there are only two areas in the United States today where wells below 10,000 ft. are common. These are South Louisiana and Mississippi. As Table 1 shows, 34.8 per cent of the completions in the first 8 months of this year in South Louisiana were deeper than 10,000 ft. For Mississippi the record was 43.9 per cent. Table 2 shows that this same situation was true in 1946; only South Louisiana and Mississippi drillers could regard wells below 10,000 ft. as routine completions.

California is often considered an area of many deep wells. Yet so far this year, less than 5 wells out of every 100 have gone below 10,000 ft. The Texas Gulf Coast area is another region that many people think of in terms of deep drilling. In 1946, fewer than 5 wells out of every 100, and in 1947 thus far, fewer than 4 wells out of every 100, have gone below 10,000 ft.

The chart with this article shows the percentage of total wells that have gone below 10,000 ft. each year from 1941 through August 1947. It is represented by that small dark area at the bottom of the chart. With all the deep wells in such areas as South Louisiana and Mississippi, the proportion of the total United States is usually about 2 per cent for these very deep wells.

Wells Below 5,000 Ft.

For those who think that 10,000 ft. is a little too deep to make comparisons, the top line on the white break in the lower part of the chart should be interesting. This line marks the percentage of all wells completed below 5,000 ft. from 1941 to date. Only in 1945 did this line nudge above the 20 per cent mark. Moreover, while there is a slight upward trend noticeable between 1941 and 1947, it is much less marked than one would expect from all the talk about the trend toward deeper drilling.

By checking the figures in Tables 1 and 2, it is obvious that wells drilled to depths between 5,000 and 10,000 ft. are more concentrated geographically than one would expect, if one judged only by the talk of trends toward deeper drilling. In the group composed of Arkansas, Rocky Mountain, California, and West Texas, wells over 5,000 ft., but less than 10,000 ft. deep, averaged about 3 out of every 10 wells in 1947 and there is little change as compared to the percentage figures for 1946 shown in Table 2. In fact the only noticeable change is that Arkansas stepped up its wells in the 5,000-10,000-ft. range as compared to 1946, while New Mexico dropped off. The result was that Arkansas dropped down from the upper group it was in during 1946, but New Mexico moved up.

The reputation of the Texas Gulf as an area of deep drilling is shown on the table to be due to the high percentage of wells between 5,000 and 10,000 ft. Actually the average total depth drilled in this area has not changed very rapidly over quite a few years. East Texas also belongs

in the group that has a substantial percentage of its wells in the 5,000 to 10,000-ft. range.

That leaves a large group of states, in which about two-thirds of all the wells have been drilled so far in 1947. In this group as a whole, fewer than 6 wells out of every 100 have gone below 5,000 ft. In the entire area east of the Mississippi River, and north of the State of Mississippi, but including West Virginia which has a reputation for deep cable-tool wells, nearly 7,600 wells were completed in the first 8 months of this year. Of these, slightly over 100 were deeper than 5,000 ft., and West Virginia accounted for about half of these.

North and West Central Texas, Oklahoma, and Kansas make up the backbone of the old Mid-Continent area, and a lot has been said about deep drilling trends in the Mid-Continent. In the first 8 months of 1947 over 6,500 wells were completed in this area. Yet a contractor with a rig capable of drilling to only 5,000 ft. could have handled about 9 out of every 10 contracts.

Even in Oklahoma with all the deep drilling in the Anadarko basin, a 5,000-ft. rig would have been ample to handle six out of every seven wells drilled so far this year.

Of course part of the answer is that a 5,000-ft. hole is not considered deep nowadays, whereas there was a time when that was a deep well. But that very fact is an explanation of the seeming contradiction that all the emphasis and publicity are on deep drilling, while shallow drilling still makes up the bread and butter of the contractor.

Deep Drilling Trends

The trend toward deeper drilling is, in part, strictly a local regional affair, and in part a much slower trend than is generally realized. The science and technology that go into development of equipment that can drill very deep wells must go in early enough to handle the deepest wells the industry wants to drill at any given time.

The result is that because there are particular spots the industry wants to test with deep wildcats, the development of drilling equipment is always far ahead of the needs for the bulk of the drilling. Furthermore, because of requirements of such special areas as South Louisiana and Mississippi, equipment is developed for routine drilling to great depths. As long as one company is willing to pay for the design of equipment to reach a great depth, that equipment will be developed, even though very few wells require such equipment.

The profit to the entire drilling branch of the industry comes from the experiments and lessons learned in developing equipment to reach great depths.

TABLE 1—1947 (8 MONTHS) DRILLING DEPTH RANGES, BY AREAS

	1947 wells completed (8 mos.)			
	Total wells	Per cent wells 0-5,000 ft.	Per cent wells 5,000-10,000 ft.	Per cent wells below 10,000 ft.
Ind.-Ill., Ky.	2,144	100.0	...	...
Michigan and Ohio	1,411	99.5	0.5	...
Pa., N. Y., and misc. states	3,462	99.2	0.6	0.2
Kansas	1,676	99.0	1.0	...
West Virginia	563	90.8	9.2	...
North and W. Central Texas	2,131	89.6	10.4	...
Oklahoma	2,764	86.0	13.2	0.8
North Louisiana	561	83.6	14.8	1.6
Subtotal	14,712	94.5	5.2	0.3
Arkansas	202	68.3	31.7	...
Rocky Mountain	462	67.3	31.2	1.5
California	1,341	67.0	28.4	4.6
West Texas	1,572	65.3	31.7	3.0
Subtotal	3,577	66.4	30.4	3.2
New Mexico	373	56.9	42.6	0.5
Eastern Texas	356	45.8	52.5	1.7
Texas Gulf and Southwest	2,191	43.7	53.1	3.2
Subtotal	2,920	45.6	51.7	2.7
South Louisiana	462	21.2	44.0	34.8
Mississippi	330	9.8	46.3	43.9
Subtotal	792	16.5	44.9	38.6
Grand total	22,001	80.7	16.9	2.4

TABLE 2—1946 DRILLING DEPTH RANGES, BY AREAS

	1946 wells completed			
	Total wells	Per cent wells 0-5,000 ft.	Per cent wells 5,000-10,000 ft.	Per cent wells below 10,000 ft.
Ind.-Ill.-Ky.	3,639	99.8	0.2	...
Pa.-N. Y., and misc. states	5,420	99.7	0.2	0.1
Michigan-Ohio	2,063	99.0	1.0	...
Kansas	2,027	98.9	1.1	...
West Virginia	755	93.8	6.2	...
North and W. Central Texas	2,805	91.0	9.0	...
Oklahoma	3,050	85.3	14.2	0.5
Arkansas	183	79.8	20.2	...
North Louisiana	800	77.1	21.4	1.5
Subtotal	20,742	95.0	4.8	0.2
California	1,790	69.7	26.6	3.7
Rocky Mountain	652	69.2	29.9	0.9
New Mexico	411	69.1	30.7	0.2
West Texas	1,780	60.8	34.8	4.4
Subtotal	4,633	66.1	30.6	3.3
Eastern Texas	687	49.6	49.1	1.3
Texas Gulf and Southwest	2,322	33.3	62.2	4.5
Subtotal	3,009	37.0	59.2	3.8
Mississippi	260	12.7	60.8	26.5
South Louisiana	584	9.6	45.0	45.4
Subtotal	844	10.5	49.9	39.6
Total United States	29,228	82.0	15.8	2.2

Left: Drilling crew at tunnel entrance, which is 8 ft. wide and 7 ft. high. It drifts down at 30° for 1,172 ft. to the mine chamber containing the rotary rig. Center: Here the crew "goes in the hole" in a most literal sense. Right: Cable hoist which raises and lowers the mine cars

Contractor Runs Rotary Rig at 460-Ft. Underground Location

CAMAY DRILLING CO., Compton, Calif., currently is doing some of the most unusual well digging anywhere in the world—with a drilling rig that is set up in Hawaii—in a mine chamber 460 ft. below the ground level. The underground working chamber was hewn out of lava formations at the foot of a 7-by-9-ft. shaft which was drifted down from the surface on a 21° slope.

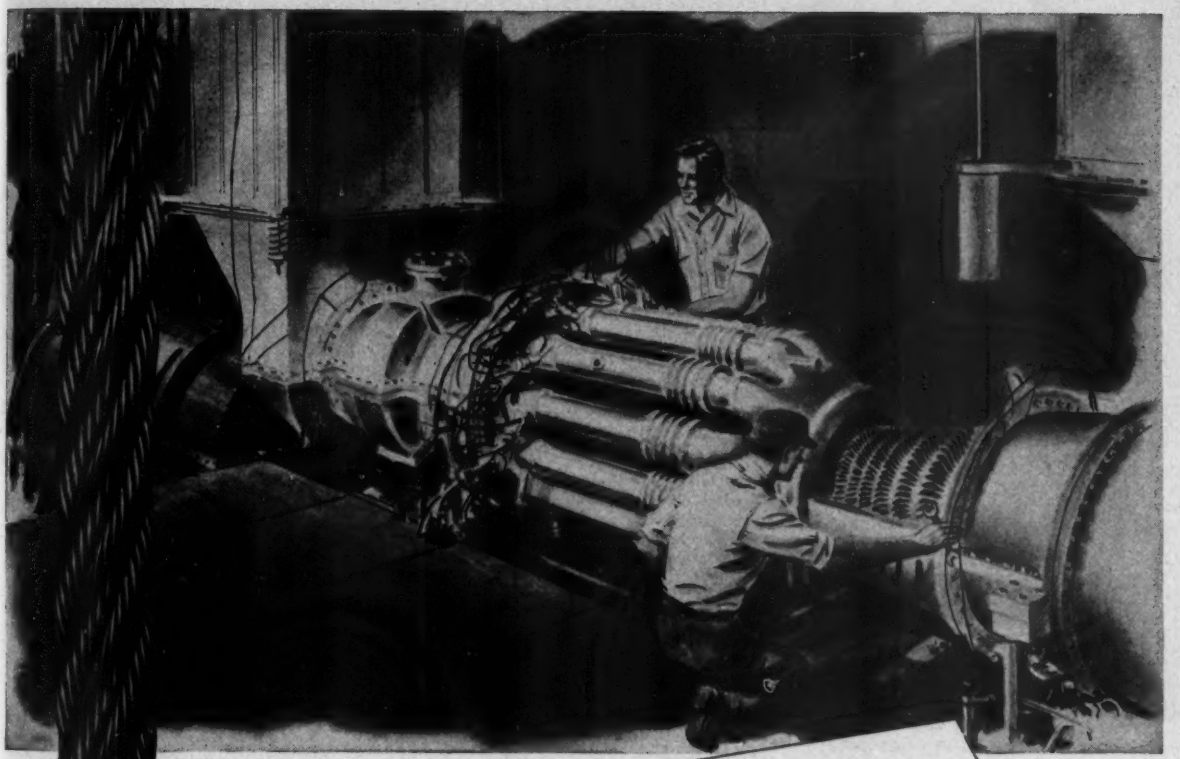
Drilling crews and materials are hoisted and lowered by means of a cable-and-hoist-operated car. A small derrick, built on a steel base in such a manner that the upper section may be skidded to drill three or more holes, is set up in the cavern and the electrically driven hoist, rotary table, and centrifugal pump rigged up in much the same manner as like machinery on ordinary surface jobs. Three shifts are worked, each crew being made up of one driller and four native helpers. The formations range from surface clays to heavy, dense basaltic lava with cinders, ashes, and other volcanics in between.

Circulation Problem

Circulation is a problem—at times much hole is drilled without it, the cuttings merely being washed off into crevices. Needless to state—the operations are extremely noisy and very rough. Range one, 6⅝-in. drill pipe and hard rock bits are used for all of the drilling. Hole size is from 30 in. down to 17½ and the wells are from 300 ft. to 1,750 ft. in depth. Another job previously finished, was approximately 800 ft. below the surface and was reached through a tunnel better than 1,200 ft. long drifted on a 30° slope. These Hawaiian drilling jobs, incidentally, are not exploring for oil —they are drilling for water which is scarce and a valuable commodity in this area (near Pahala, Island of Hawaii).

Running perforated casing into the well

Left: Time off for a picture at one of the underground locations. Three wells were drilled in this chamber, each 310 ft. deep. For the first 125 ft. drilled, hole size was 25 in., with the remainder a 22-in. hole. Right: A small railroad system transports the drilling equipment to the mine entrance



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SAFETY on Rotary Rigs

... 100 MAJOR CHECK POINTS

This check list is an adaptation of preliminary work carried on by a committee appointed at the Drilling Industry Accident Prevention Clinic held in Dallas, Tex., June 10-11, 1947. The committee combined the best features of existing check sheets into one standard form which can be used by all drilling contractors and oil companies. Work is being carried on in conjunction with the American Association of Oilwell Drilling Contractors which sponsored the safety clinic. Members of the three-man committee are: R. E. Dishman, Penrod Drilling Co., W. F. Rickards, Shell Oil Co.; and Rayford W. Lindsey, Pacific Employers Insurance Co.

DERRICK AND DERRICK EQUIPMENT

Condition of foundation.....Is cellar clean and free of debris?.....Legs.....Relegs.....Girts.....Braces.....Any loose members?.....Any loose or missing bolts?.....Is ladder in good condition and securely bolted its entire length?.....Is walk around in good condition and does it have guard rail?.....Gin pole.....crown block.....Cat line and sheave.....Is floor even and free of holes and loose boards?.....Are steps of even width, level, and equal rise?.....Is end of ramp flush with rig floor, so as to prevent pipe hanging up?.....Are all handrails standard height and secure?.....Are walkways even, free of holes, and securely anchored?.....Is treble or monkey board securely bolted to derrick frame?.....

DERRICK MAN'S LINE, BELT AND SAFETY

Are all oil-soaked safety belts and ropes promptly replaced?.....Are all safety belts and ropes that come in contact with acid immediately replaced?.....Is any long safety belt rope used?.....

MUD HOSE, CLAMPS, AND SAFETY CHAIN

Is the rotary hose snubbed at both the standpipe and the swivel?.....Does standpipe have a safety chain?.....What date were weight indicators checked for accuracy?.....Are slips in good condition?.....Is cathead smooth and free of grooves?.....Are there any exposed keys on cathead?.....Is auto cathead in good working condition?.....Is spinning line (chain) free of surface brittleness and other signs of fatigue?.....Are water and steam hoses controlled with a globe valve in good condition?.....Are lights and wiring in good condition, well insulated, and free of exposed wire and abrasions?.....

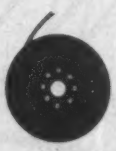
ELEVATORS, PINS AND BAILS

Are the elevators securely bolted in, and the elevator bails equipped with a latch that will prevent them from falling out?.....

ROTARY TONGS, COUNTERBALANCES, AND SAFETY LINES

Are all tongs equipped with sharp dies?.....Are tong lines at least ⅜-in. steel wire rope?.....Are tong lines equipped with two properly set clamps at both ends?.....Are short ends of tong lines fused and moused?.....Are break-out tongs equipped with steel safety lines as well as regular tong lines?.....Are tong weights snubbed, or placed under derrick floor, or in pipe slides?.....

DRILL LINE, CLAMPS, DEAD END, GUIDE LINE



Is the dead-line anchorage, at corner of derrick, around derrick sill?.....Is the dead line clear of all possible metal parts?.....Are traveling-block guards securely bolted in place?.....Is dowel pin in hook in good condition?.....Hook, nut, and spring.....

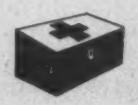
MUD SYSTEM

Are valves provided to relieve trapped pressure in both steam and fluid ends of pump?.....Condition of pressure relief valve.....Any low-pressure fittings used in system?.....Are mud pumps manifolded to permit complete isolation when making repairs?.....

CONDITION OF DRAW WORKS

Are brakes and brake bands tested and inspected each tour?.....Are chains, sprockets, and clutches completely guarded?.....Are the drum and lines guarded sufficiently?.....Are clutch pedal and auto cathead pedal rods free of corrosion and in good working condition?.....Is line-guiding device installed so not to cause an accident?.....Is coring reel properly anchored and tied down?.....

PROTECTIVE EQUIPMENT



Are employes using hard hats?.....Safety shoes?.....Are goggles available?.....First-aid kit, full supplies?.....Snake-bite kits?.....Burn kits?.....Do all crew members wear clothing suited to the job?.....

BOILERS—CONDITION AND EQUIPMENT

Are all boilers equipped with two relief valves?.....Are all boilers operated at or below pressure recommended by manufacturer or approved by state or insurance company boiler inspectors?.....Are all boilers equipped with stop-check valve on header?.....Are all boiler gages checked frequently for accuracy by a test gage.....Are boilers set at right angles to the rig floor and on the normal windward side?.....Are boilers 125 ft. from derrick?.....Are all blowoff lines piped away to secluded area?.....Are all steam lines equipped with a bleeder piped to drain steam to secluded area?.....Are safety valves checked each day to see if they blow at pressure set?..... Any low-pressure fittings used in steam lines?.....Any leaks, bags, or blisters in furnace?.....Fusible plugs.....Scaffold boards between boilers.....Feed-water supply adequate.....Condition of feed-water system. . . .Condition of fuel system. . . . .

HAND TOOLS

Do all pipe wrenches have sharp hook and heel jaws?.....chisels mushroomed?..... Are the handles of hammers and axes straight and free of defects?.....Do the faces of hammers show signs of fatigue?.... Is rig equipped with pipe and machinist's vises?.....Are hand tools kept on tool boards?.....Date of last hand-tool inspection.....Are end wrenches in gage and not sprung?.....

GENERAL

Are posters changed on bulletin board each week?.....How is housekeeping generally?.....Any projecting nails?.....Any fire hazards at this location?.....Are blowout-preventer drills held regularly?.....Are weekly safety meetings held for each tour?.....Do all crew members understand and know how to operate controls on the blowout preventer?.....Is there safe access to every point where men must go?.....Are racks and storage facilities strongly built?

Below is a form for periodic inspection of drilling rigs. Noble Drilling Co. Tulsa has developed this type of form in conjunction with its insurance underwriters. A safety check is made of each Noble rig each 60 days, or oftener

Safety Check List—Rotary Rigs

Rig No. ..... Area ..... Date ..... Pusher .....

GUARDS—	IF O.K.	REMARKS
Drum		
Chain draw works		
Shale-shaker belt		
Traveling block		
Cathead		
Pump belts		
Rotary drive		
Generator belts		
STAIRS AND FLOORS—		
Stair steps		
Railings on stairs		
Railings on floor		
Catwalk floor		
Derrick floor		
DERRICK FLOOR—		
Elevator bails tong lines—(securely fastened — safety line through eye)		
Cathead (smooth)		
Cat line (strong—not frayed)		
Tong weights (securely guided into floor)		
Rotary hose (well-snubbed)		
Emergency derrick exit		
Kelly-line snatch block (securely fastened)		
Cat-line hookup		
Periodical check of bolts and fastenings on long job		

GENERAL—	IF O.K.	REMARKS
Fourble board (securely "U" bolted and strong)		
Dog house (should have two doors and clean)		
Stoves (well connected and insulated to floor)		
Crown block tied down		
Wiring—give details		
Warning signs		
Pipe racks (strong—level)		
Hand tools (well arranged—not worn)		
Safety belt (at least two), first-aid kit (properly filled—in handy place)		
Safety posters up		
Crews wearing hard hats and safety shoes		
Goggles available		
Boilers—if used give details		
Steam connections (securely—not leaking)		
Fire extinguishers		
Blowout preventers		
Gasoline (isolated in red or red-striped container—spouted can and funnel)		
Butane or gas tanks (set at right angle to derrick)		
Housekeeping		

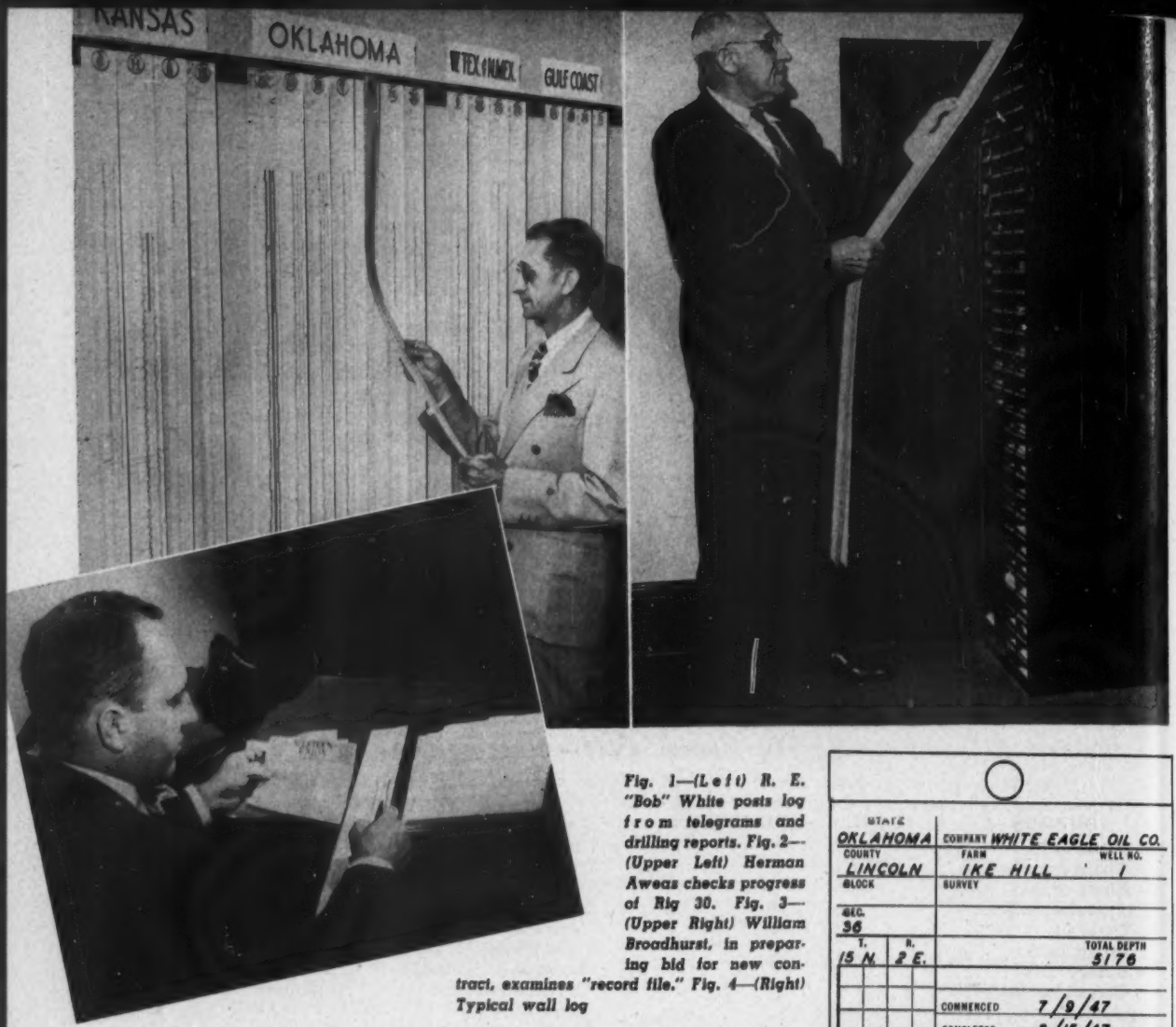
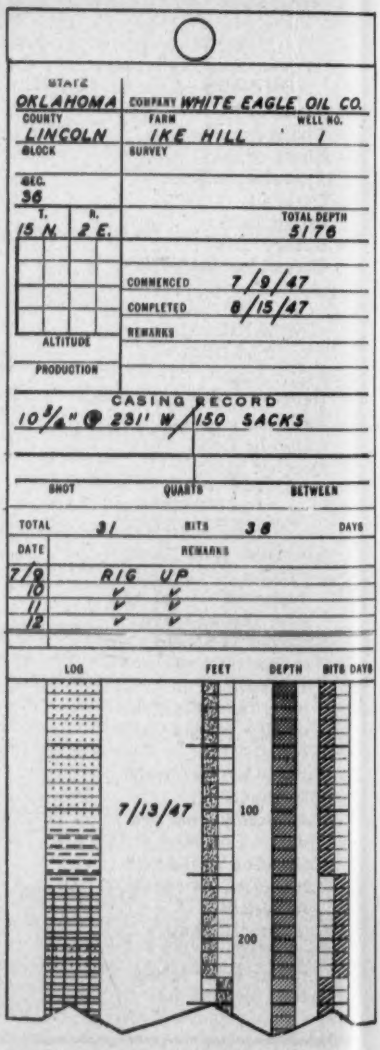


Fig. 1—(Left) R. E. "Bob" White posts log from telegrams and drilling reports. Fig. 2—(Upper Left) Herman Aweas checks progress of Rig 30. Fig. 3—(Upper Right) William Broadhurst, in preparing bid for new contract, examines "record file." Fig. 4—(Right) Typical wall log



Wall-Log System Rides Herd On Operations of Rotary Rigs

by Leigh S. McCaslin, Jr.

THE drilling firm of Helmerich & Payne, Inc., keeps abreast of the activities of the company's rigs throughout the United States by a unique wall log system, which is posted in its headquarters office in Tulsa. This system provides a quick and comprehensive picture of the progress of the firm's various rigs which are currently on contract.

As explained by Bob White, assistant drilling superintendent, time is the dominating factor in the drilling business and the company's system was inaugurated "to help fight time" in completing contracts. In one quick glance, Herman Aweas, drilling superintendent, or W. H. Helmerich, president, can determine whether or not a job is progressing satisfactorily and take appropriate steps if it is not.

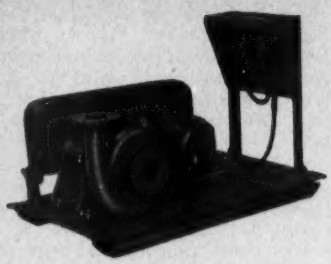
In addition to being a day-to-day check on the progress of a job, the system provides information on four other important points:

1. An indication of crew efficiency is given.

2. Equipment efficiency can be determined, and comparisons made between various bits, draw works, etc.

3. A profit or loss estimate can be made on a job before a detailed re-

VERNON CENTRIFUGAL PUMP



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port is available from the accounting department.

4. Data on completed jobs can be used for preparing a bid estimate to be submitted for future jobs which are in the same area or which will drill under similar conditions.

Description of System

Basis of the system is a printed log-like form (see Fig. 4) which is posted for each individual contract. Development credit goes to Aweas who devised the form several years ago. The top 9 in. of the form contains a description of the well location, date commenced, date completed, casing record, shot record, total bits used, days necessary to complete the job, and 32 lines for remarks concerning special features of the job.

The remaining 4½ ft. of the form contains four vertical columns, all of which are marked off in vertical units. The first column is a geological log of the well. Vertical units in the second column represent feet and this column is plotted to show the feet per day drilled. The purpose of the thin vertical line running down the center of this column can be explained thusly: The first day's footage is plotted on the left side of the line, the second day's footage on the right side, the third day's on the left side, etc., alternately down the column. This procedure makes it easy for the eye to compare day-to-day drilling footages. In the margin to the right of the column, drilling days are written in, that is, day number "1" on the job, day number "2" on the job, etc.

In "crooked hole country," the deviations from vertical are plotted as received on the daily telegram and explain slow drilling progress.

The third vertical column represents the contract depth and is filled in with a colored pencil when the contract is received. This column makes it possible to glance at the actual feet drilled and then at the contract depth and get an idea as to what portion of the contract is completed to date. In the fourth column, a record is kept of the bits and the footage each bit drills. Bit numbers are written in on the margin at the right side of the column.

Between the first and second column the date is stamped level with the bottom of each day's drilling footage.

Posting Procedure

The footage column on the form is posted every morning (see Fig. 1) from daily telegrams sent in by the company's district drilling superintendent. The bit record is posted from the daily drilling reports for each rig which are sent to the Tulsa office by mail and are therefore a day or two behind the footage information.

The forms are kept on the wall in

(Continued on page 145)

Diamond-bit Coring at Rangely

by Neil Williams

SINCE diamond-bit was introduced in Rangely field of northwestern Colorado about a year ago,* both techniques and bits have been and still are being improved steadily. Improved bits, together with accumulated experience and greater "know how" in running them, are enabling operators to increase greatly the average footage made per bit. This, with new practices and applications in their use, is resulting in constant reductions in drilling time and important savings in over-all well costs.

*Neil Williams, "Diamond-Bit Coring in Rangely, Colorado, Field," The Oil and Gas Journal, January 4, 1947, p. 48.

Use of diamond-bit core heads at Rangely is in the Weber producing section. This consists of a very hard, tightly cemented sand with a thickness up to approximately 650 ft. above the water level in the higher wells. Originally, the bit use was undertaken primarily as a means of expediting coring, which, because of excessive time required and high costs involved in use of conventional rock-bit core heads up to that time, had to be restricted to scattered, carefully selected key wells. Coring the section with diamond heads was found even faster and cheaper than drilling it with conventional rock bits, and since then has been adopted as general procedure. In this, the advantages of getting cores of the section from all wells, although important, have become secondary to the economics involved in drilling the section.

In the first well (Stanolind Oil &

Below: Out of the hole with a 90-ft. core barrel being tried out by California Co. with diamond-bit coring at Rangely. Picture shows diamond-bit head still on bottom of barrel

Right: Removing core from 90-ft. core barrel. Barrel shown has no inner barrel. Picture shows holder-clamp device to hold core while breaking off bottom section Lower right: W. C. Savage, California Co. scout, examines diamond-bit core head taken from bottom of core barrel just pulled and from which a piece of core is being broken

Gas Co. 1 Mary E. Helfley) on which diamond bits were run, 204 ft. of section was cored. Three heads were used, the last making 102 ft. In succeeding early wells up to the first of this year, the average was approximately 200 ft. per bit. Within recent months, the average has been increased to more than 400 ft. per bit. One bit run by California Co. recently completed a total of 1,109 ft., being used in three different wells. When pulled it still was considered good for additional footage, and is being run again in another well. In a number of instances lately, bits have made more than 700 ft. each.

Conventional coring of a full section normally has required from 20 to 30 rock-bit heads. With these, average cutting time has run around 30 minutes per foot as compared with an average of from 10 to 12 minutes per foot with diamond heads. In a number of instances cutting time with diamond heads has been as low as 7.5 to 8 minutes per foot. Overall time in the section with conventional coring, including trips, circulating, and the necessity for reaming, often run as much as 35 to 40 days. In conventional drilling of the section as many as 20 to 25 days have been required. With diamond-bit coring, equivalent section is being completed within 8 to 10 days, this varying to as low as 1 to 2 days depending on the amount of section cut.

Principal improvements in bits have been in the use of larger Congo diamonds set in spiral arrangement on the mattrix, or cutting head, and in the elimination of water courses from the cutting head. There is some question as to the merit of the latter change, although it has been felt that the jetting action of the circulating fluid has tended to cut out the water courses and cause premature breakage and failure of the bit heads. Some operators still prefer to use heads with water courses. One type of bit now being used has the diamond-bearing cutting head fused instead of screwed on the head shank forming an integral unit. This construction was designed to minimize the hazard of the head coming off and being left in the hole, and thus necessitate a costly fishing or whipstocking job.

Fewer Round Trips

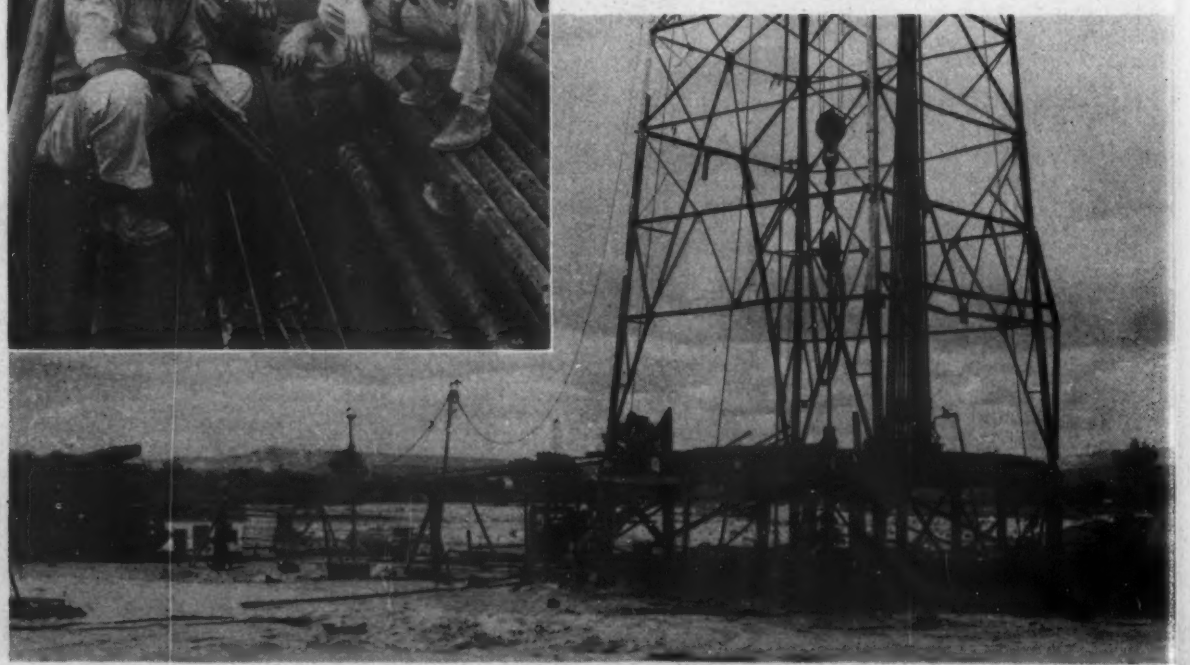
With the greater footage obtained by diamond bits, most trips out of the hole during drilling of the producing section are necessitated only to recover cores. Reductions in the number of trips for this purpose are being made by use of longer core barrels and the taking of more core on each run. In the first wells cored with diamond bits, 25-ft. barrels were used. Thirty-foot barrels next came into use. These since have been supplanted by 50-ft. barrels, which are now in general use.

Recent introduction by California Co. of a 90-ft. barrel is of particular interest and may lead the way to general adoption of this length barrel, although this is the longest barrel which can be handled in the 122 and 136-ft. derricks now in the field. Two types of barrels of this length are being tried, one having an inner barrel as in the previous barrels, and the other without an inner barrel. The former type, which has been tried out in three recent wells, consists of an outer barrel and six sections of inner barrel which can be made up in 30, 60, or 90-ft. lengths. Its design has been improved over previous barrels in that bearings for the inner barrel swivel come in cartridges. If bearings fail, a new cartridge is inserted easily. This eliminates the change of scraps of bearings dropping down the hole where they might cause damage to the bit. The long barrel so far has given no more trouble than the 50-ft. or shorter barrels, and as in the case of the shorter barrels approximately

(Continued on page 173)

Left: William King (center), tool pusher for Noble Drilling Co.; Savage (center); and Jack McMinn, petroleum engineer for California Co., examine part of 90-ft. core

Below: TCS Drilling Co. reverse-circulation cleanout rig used by Stanolind Oil & Gas Co. in diamond-bit coring operations in Rangely field. Hoisting draw works and rotary-drive engine units are shown at extreme right. Rotary is driven by a 75-ft.-long drive shaft. Pump and reverse-circulation manifold are located in center foreground



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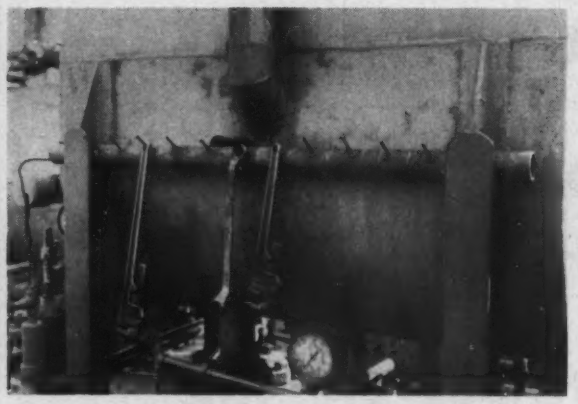
OPERATING IDEAS

Handy Tool Rack

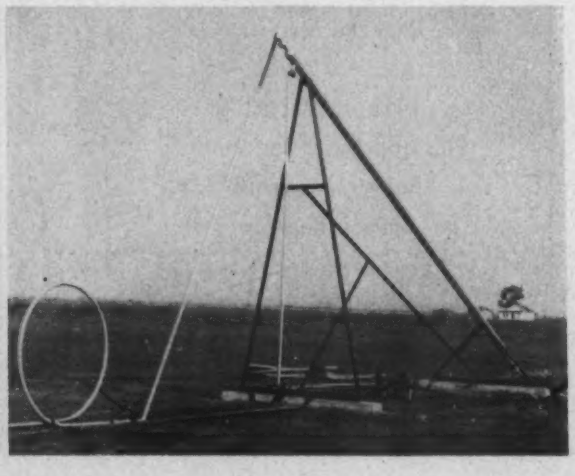
ADVANTAGE is taken of the horizontal pipe forming the top of one side of the feed-water support to make a convenient support for tools used in servicing the feed-water pump assembly. Along the side of the pipe,

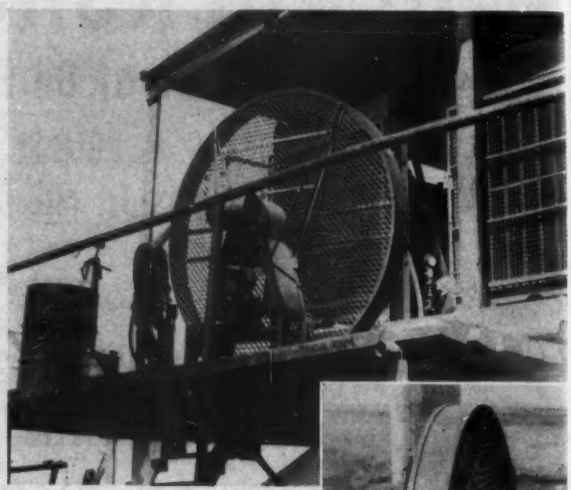


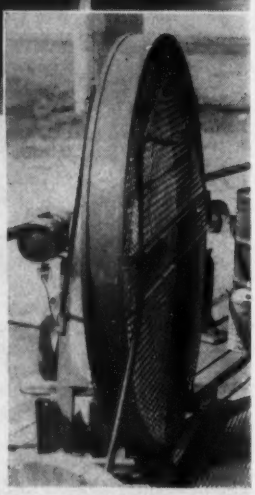
and sloping slightly upward, a series of short stubs of ¼-in. rod is welded, some 6 in. separating the various pegs thus formed.

Knockout Vibration Snubber

TO prevent damage to threaded connections on the salt-water knockout through vibrations set up in the flow line by pulsations in the stream from the well, one company utilizes a 6-ft. circle on the 2-in. line just ahead of the riser to the upper end of the inclined knockout. The loop is supported by a clamp around only one section of the pipe at the base where the circle is completed, leaving the end to which the well is attached free to expand or contract with temperature changes, as well as act as shock absorber to dampen out fluid pound as slugs of liquid or gas speed through the line under high pressures. The inclined knockout is supported near both ends, but is retained only by a lug welded at the top to engage the upper bracket, so that the lower end is free to expand or contract without stressing the support, or tending to overload the threaded connections of either inlet or outlet lines.







Bug Blower Cools Drilling Engines

A BUG blower is being used by Nichols-Duncan Drilling Co. in the West Velma field, Oklahoma, to cool drilling engines. The 60-in. fan is eliminating overheating on the engines with the aid of a water spray. A section of perforated rubber hose is serving as a sprinkler for the water, as can be seen in the inset photograph.

Portable Steam Heater for Derrick Floor

A SMALL and easily placed steam heater for the drilling crew consists of an ordinary radiator salvaged from an old automobile and a fan driven by a small steam turbine. Steam which supplies the motive power for the turbine is discharged through the radiator to provide the heating medium. Having a flexible hose connection from the live-steam source, the heater can be moved about to any place on the derrick floor desired.

Wall-Log System

(Continued from page 140)

the office of Bob White (see Fig. 1) and are segregated by operating areas. They are hung on nails and a round cardboard tab indicating the rig number is kept on the nail over the form, as can be seen in the picture.

If another well has been previously drilled in the area where a current contract is under way, the completed form on this well is posted adjacent to the current well. In this manner it can be seen whether the current well is proceeding at a satisfactory rate as compared with the earlier well. Also, any difficult or unusual operating conditions met in the drilling of the first well can be foreseen.

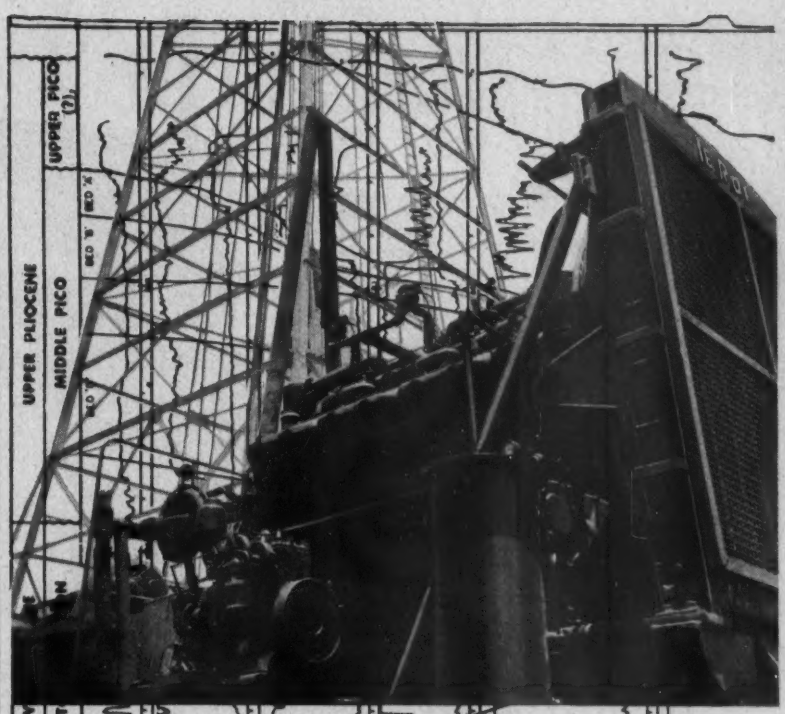
After a well has been completed, the form is filed in a cabinet (see Fig. 3) by counties and retained for future reference. These historical records are very valuable in the preparation of a bid estimate for future jobs which are in the same area or which will be drilled under similar circumstances. A very good idea can be obtained as to how many days the job will take and how many bits will be used. In addition, any unusual or difficult operating conditions will be known and provisions can be made in the bid estimate to handle them.

Immediately after a contract is completed, a fairly accurate estimate can be made as to the profit or loss which the company made on the job. This is important because it normally takes several weeks for the accounting department to give an accurate profit or loss figure. During this time, it is quite possible that the company will be asked to submit a bid on another job in the area and will want to know how it stood on the first job. Knowing that it has certain fixed costs and having a good idea of daily operating costs from previous work, the company can use the wall forms and prepare an estimate of the financial outcome of the job. This information makes it possible to submit a more logical bid on the current job.

Sunray Drillers Hold National Safety Record

The drilling department of Sunray Oil Corp. led all other drilling departments in the United States with a perfect safety record in 1946 and half of 1947, according to a report by the National Safety Council.

The Sunray drillers' frequency rate, based on the number of disabling injuries per man-hours worked, was zero, as compared to the national drillers' average of 59.1; their severity rate, based on the number of days lost per man-hours worked, was also zero as compared with the national drillers' rate of 4.51.



Geology plays tricks

. . . but you can always count on LE ROI reserve power, acceleration, and dependability to make hole faster with larger profits for you

Formations vary, giving drillers a bad time, but Le Roi performance is always dependable. First of all, Le Roi engines are conservatively rated — there's a lot of reserve power in every unit, put there to help your crew out of tight spots. Moreover, every part in the engine is designed to handle all this extra power with ease. That is why Le Roi engines keep on lugging.

Round-trip time is reduced because of the rapid acceleration engineered into each Le Roi engine. Le Roi's jump like jackrabbits when you give them the gun — you get back to drilling in a hurry, make hole faster and at greater profit.

See your nearby Le Roi distributor. He can show you the Le Roi engine best suited to your job. Horsepower sizes range from 4 to 400, and they operate on natural gas or butane, as well as gasoline. Let him show you, detail by detail, why so many oilfield men standardize on Le Roi engines. Write for latest, fact-filled bulletins.

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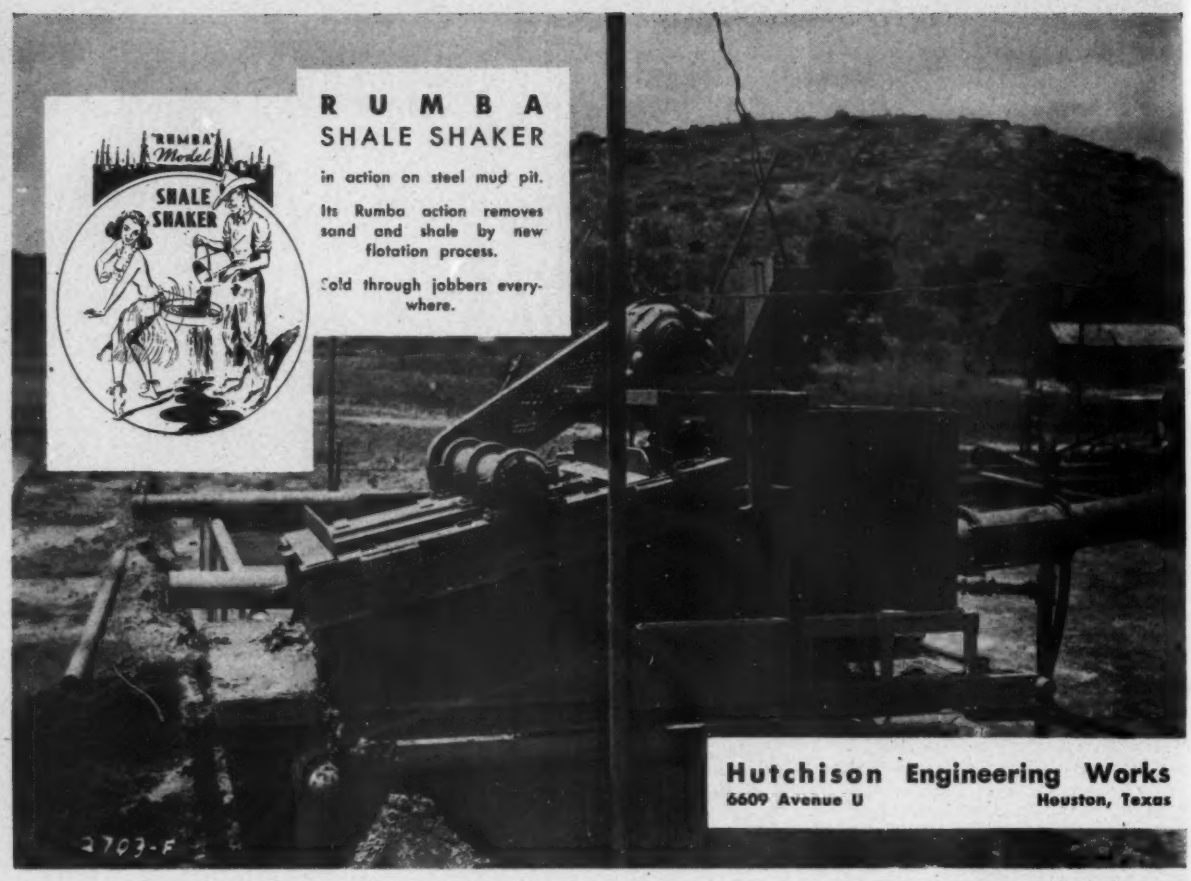

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Reverse-Circulation DRILLING

PROVES PRACTICAL IN WEST TEXAS

by George Weber

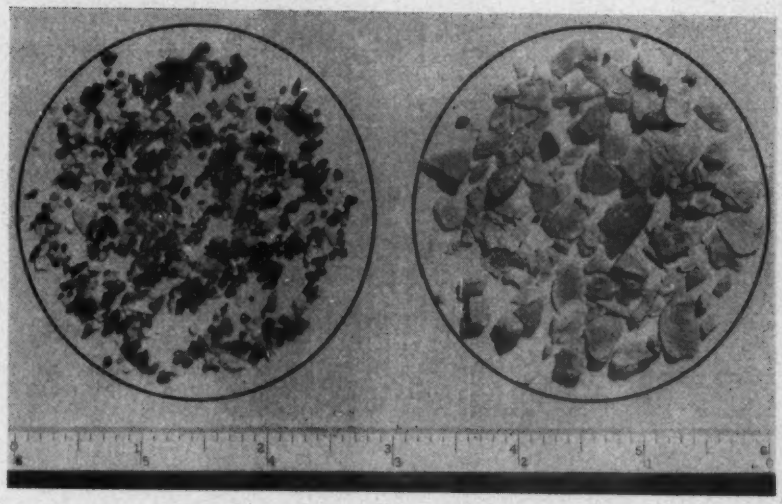
AS a means for obtaining better subsurface information on certain formations in the Permian basin, at costs well below those incurred through coring, the use of reverse-circulation drilling has proved very satisfactory in a number of wells drilled to date. Limited in general to what is termed "hard rock drilling," the practice provides a recovery of unusually large cuttings. Such samples, augmented by a few key cores taken over a structure, provide a practical and economical means for evaluation of formations penetrated in the development of some West Texas fields.

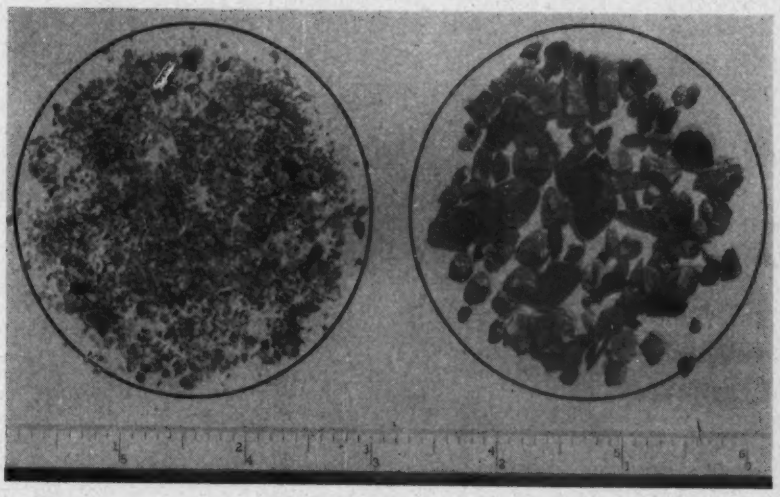
Reversal of the fluid stream whereby mud or oil is pumped down the casing - drill pipe annulus and returned through the drilling string, has long been practiced in that area when drilling in wells for completion. The method is now being investigated for use up the hole. Applied at first to a few key sections, it is now being used experimentally in drilling continuously below the intermediate casing seat.

A number of early mechanical problems have been solved and the proposed continuation of the study is expected to result in further improvement in the technique. Those who have followed the new method most extensively have been well satisfied with results and the use of reverse circulation in drilling shows promise of wider adaptation in West Texas and New Mexico.

Effect on Drilling Progress

Certain secondary results of reverse circulation are attracting considerable interest at this time. Comparative results indicate that this method of obtaining large cuttings has not affected drilling progress adversely; but has, in fact, resulted in improvements in certain instances. Bit performance, hole gage and over-all drilling time have been bettered in several tests. While these factors are still regarded as secondary and the practice would be considered feasible even with rela-





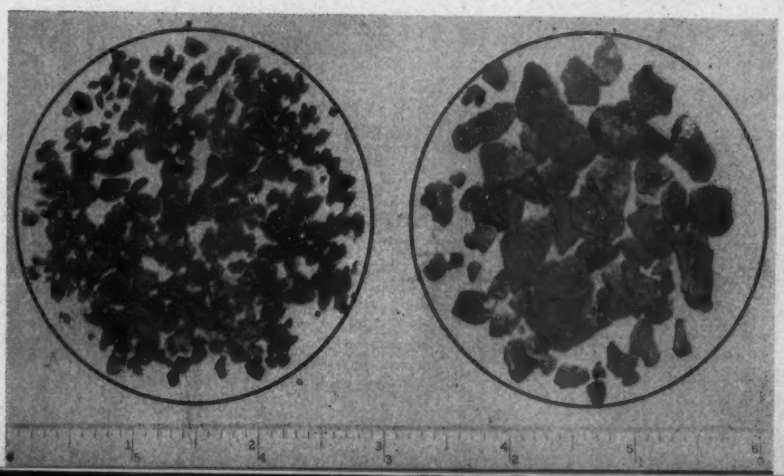


Fig. 1—(Top) Devonian chert cuttings taken from two TXL wells

Fig. 2—(Center) Ellenburger dolomite cuttings taken from two TXL wells

Fig. 3—(Bottom) Permian lime cuttings taken from two Russell wells

tively less drilling efficiency, their disclosure lends even greater importance to the study than was originally anticipated. At present, the need for obtaining further subsurface information from larger cuttings remains the primary reason for resorting to reverse circulation. Its use solely for improvement of drilling efficiency is contingent on further investigation and certain advancements in technique.

Current investigations of the new practice in the Permian basin were begun in early 1946 by engineers of Shell Oil Co., Inc., who have taken a leading part in studying its possibilities. The work was prompted by geologists' requests for better samples from the formations penetrated while drilling wells in TXL field of Ector County. In routine field drilling, coring had been minimized and the small cuttings recovered from normal drilling proved inadequate for accurate laboratory evaluation. Coring entailed not only considerable added expense, but often failed to produce results, since poor core recoveries are not unusual from the formations encountered in that area. It was decided that circulation should be reversed while drilling those formations on which added data were needed, and normal circulation be resumed while drilling the remainder of the hole.

That plan was followed in three TXL wells drilled by a company rig. Good results, solution of original mud loss problems, and improved crew efficiency prompted further investigation and the work continued at TXL and elsewhere with company and contractors' rigs drilling increasingly greater sections with circulation reversed. To date over a dozen wells have been drilled partially by reverse circulation, not counting the many other wells which are drilled into the pay by that method.

Good Cuttings Recovered

Disregarding the other aspects of this type of drilling, the original objective was realized almost from the first. Cuttings show a marked contrast to those recovered from conventional circulation drilling. The dense pre-Permian formations, objects of principal interest, consist mainly of limestone, dolomite, and chert, which break clean under the chipping action of heavily weighed bits. By washing such samples toward the center of the bit and up the drill pipe, their regrinding by the bit and by the abrasive action of the drill pipe rotating against the open hole is avoided. Figs. 1-3 illustrate the contrast between cuttings obtained by the two circulation methods, from comparative sections in six wells. The pre-Permian samples of Devonian chert and Ellenburger dolomite, Figs. 1 and 2, were taken from wells drilled at TXL. The Wichita dolomite, Permian, shown in Fig. 3, was recovered from two comparable tests in Russell field of Gaines County.

Not only are cuttings larger, allowing more reliable analysis, but the greater velocity of the returning mud stream allows closer correlation with drilling depth and quicker indication of bit progress into new formations. Return through the drill pipe also reduces sample contamination and carryover. Since the study of cuttings alone will not permit determination of permeability, key coring in selected field wells is still necessary for correlation between porosity and permeability. Cuttings provide the remaining data required for evaluation of formations and interpretation of electric and radioactive logs.

Results of Two Methods Compared

Direct comparison of drilling progress by the two circulation methods reveals a number of interesting points. It was recognized that early com-

TABLE 1—COMPARISON OF DRILLING PROGRESS BY CONVENTIONAL AND REVERSE CIRCULATION THROUGH A 238-FT. DEVONIAN CHERT SECTION, TXL FIELD, WEST TEXAS

Well	Section thickness drilled (ft.)	Total actual drilling time through section (hours)	Average penetration rate (ft./hr.)	Total footage drilled by bits involved (ft.)	No. bits used	Average footage per bit (ft.)	Total net rig time through section (hours)	Mud characteristics: Type	Avg. wt., lb./gal.	Avg. visc. (sec.)	Filter loss (cc.)	Type circulation
A-1	238	85.25	2.79	243	14	17.36	168.9	water-base bentonite	9.4	40.7	17.15	Normal
A-2	238	54.16	4.38	275	9	28.33	94.9	w.b.b.	8.92	37.8	11.25	Normal
B-1	238	55.90	4.26	355	8	44.37	93.8	oil-base emulsion	8.82	43.0	6.1	Normal
B-2	238	50.90	4.68	272	9	30.22	103.4	w.b.b.		no data		Normal
Average of four conventionally circulated wells		61.55	4.03	286	10	40.07	115.2					
B13	238	64.76	3.67	271	7	38.71	94.6	w.b.b	8.98	32.6	22.0	Reverse

TABLE 2—DRILLING PROGRESS OF EIGHT WELLS PENETRATING FOUR COMPARABLE SECTIONS WITH CONVENTIONAL AND REVERSE CIRCULATION, TXL FIELD, WEST TEXAS

Well	Formation age—	Section thickness (ft.)	Rig time on location (hours)	No. of bits used	Avg. footage per bit (ft.)
Conventional circulation:					
A	Permian	1,202	151	10	120.2
B	Lower Permian	182	134.5	6.2	29.3
C	Devonian	160	346	34	4.7
D	Ellenburger	244	106	*7	15.14
Average for conventional circ.			184	14.3	42.3
Reverse circulation:					
A'	Permian	1,202	221	13	92.5
B'	Lower Permian	182	96	5	36.5
C'	Devonian	160	228	†17	8.7
D'	Ellenburger	244	104	4	26.0
Average for reverse circulation			162	9.8	40.9

*One 7⅞-in. bit used to drill 83 ft. into section and 5½-in. casing set. Remaining six bits, 4¾-in. drilled plug and hole to completion depth. †7¾-in. bits used.
Note: All bits 7⅞-in. except where noted otherwise.

TABLE 3—DRILLING PROGRESS OF THREE WELLS DRILLED BY CONVENTIONAL AND REVERSE CIRCULATION, RUSSELL FIELD, WEST TEXAS

Well	Circulation method	Depth of correlative sections penetrated: From	To	Section thickness (ft.)	Total actual drilling time through section (hours)	Average penetration rate (ft./hr.)	Total footage drilled by bits involved (ft.)	No. bits	Average footage per bit (ft.)	Net total rig time for section (hours)*
X	Conventional	4,200	7,337	3,137	696	4.5	3,137	55	57.0	998
Y	Conventional	4,250	7,452	3,202	648	4.9	3,202	57	56.2	970
Z	Reverse	4,252	7,300	3,048	576	5.3	3,048	42	72.6	926

*Less testing time and down time. All bits used—7⅞-in.

parisons of a limited number of tests could not be considered conclusive, since formation characteristics, particularly of pre-Permian sections, often vary widely from location to location. However, the rather consistent results of a number of tests indicate at this time that reverse circulation may promise some drilling progress in limited cases.

For example, drilling progress made through a 238-ft. Devonian chert section at TXL with reverse circulation is compared in Table 1 with four nearby wells penetrating the same section with normal circulation. All were drilled by the same rig and crew. With the exception of filter loss and viscosity, the water-base bentonite mud used in the reverse-circulated test was comparable to that used in the others. Footage per bit was computed by adding that footage drilled above and below the correlative section by those bits which entered and left the section. It will be noted that one conventionally drilled well used oil-base emulsion mud, showing definite improvements over those employing water-base bentonite muds. Although actual penetration rate was slower with circulation reversed, the increased footage per bit reduced round trips sufficiently to result in an improvement in over-all rig time through the section, discounting down time and testing time.

Better Drilling Progress

Similar comparisons were tabulated for eight other TXL tests; four drilled with each type of circulation through various sections ranging from Permian to Ellenburger dolomite. Table 2 indicates the same improvements in bit life and over-all rig time for reverse circulation in drilling the lower Permian and pre-Permian sections. Through the greatest section, 1,202 ft. of Permian limestone, however, the well drilled with conventional circulation showed better drilling progress on all points.

During the latter half of 1946 and early 1947 three wells were drilled in Russell field by a common rig and crew. The last test drilled a 3,048-ft. Permian section with reverse circulation. Comparison of data on the three wells, shown in Table 3, bears out the general indication that reverse circulation increases bit efficiency and reduces rig time, and in addition shows greater penetration rate for the nonconventional method. All bits were 7⅞ in. in size and water-base bentonite mud was used throughout.

Observations at this stage of the investigations indicate that improved bit efficiency through hard, dense formations is the most prevalent result of reversing mud flow during drilling. This is believed due to the fact that the reversed mud stream removes cuttings more rapidly from the bottom of the hole. Regrinding of the extremely hard chert cuttings

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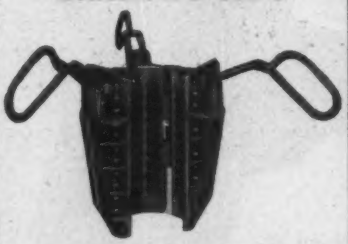

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will increase tooth wear in a rock bit to a marked degree. Reduction of wear on the outer teeth of the bit by the inward movement of cuttings is also evident from the fact that reverse circulated holes show much truer gage, relieving the necessity of reaming to bottom when going in the hole with a new bit.

The extra attention required for reverse circulation and the added operational difficulties of drilling with blowout preventer and stripper head appear to be more than offset by the time saved on round trips to replace worn bits. More experienced crews and improved equipment may further add to time saved in future operations.

On the other hand, certain hazards and adverse conditions limit the extent to which reverse circulation can be employed. Loss of mud and complete loss of circulation result in some cases. That may be partially prevented by proper mud conditioning, but the practice has proved unsatisfactory in drilling some shale sections and some highly fractured lime formations. The presence of gypsum or anhydrite also limits the use of reverse circulation, since in the absence of the jetting action of mud on bit teeth, such cuttings tend to ball the bit and greatly reduce tooth penetration.

It remains that reverse circulation has proved the only method for obtaining good cuttings of certain formations in the Permian basin, and on that basis alone its continued use seems assured until some better practice is developed. Any improvements in drilling efficiency are considered added economy. Continuation of the advancement in technique and equipment may well result in extension of the practice to improve rig time in the highly competitive drilling industry of the Permian basin.

Texas Plans Largest Mineral Lease Sale

A total of 3,795,000 acres will go to the highest bidder when Texas holds the largest mineral lease sale in its history November 4. Formal notice has been issued for bids on the areas, 1,875,000 acres of which is in the Gulf of Mexico.

This will be the first mineral lease sale involving the Texas "tidelands" along the Gulf Coast area since the U. S. Supreme Court ruled that similar areas off the California coast belong to the federal Government.

Tanker Imports Drop

Tanker import cargoes decreased from five billion pounds in May to four billion pounds in June. Sixty-nine per cent of the June cargo was carried by American tanker vessels while 72 per cent was carried the previous month, according to the Department of Commerce.

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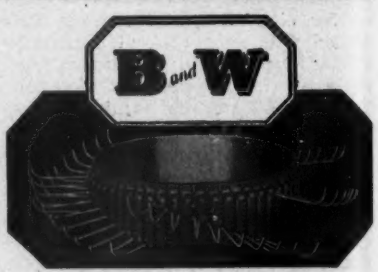

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Left: Laboratory work on drilling-mud "know how." Right: Quick and efficient rig moves are emphasized

New College Work Will Help Drilling Contractors

Young Men Given Practical Training at Kilgore College

TWENTY-TWO young men from half the world around are enrolled in special courses in drilling practices in Kilgore College, Kilgore, Tex. The 2-year program includes a thorough orientation of drilling procedures, with a mud program constituting the basis for study for the first year. Four complete sets of testing and mixing equipment are used in the college drilling-mud laboratory.

Electric and acetylene welding are also included in the course of study. The welding necessary for setting up a rig is done by the class. Spanish is available for those who plan to seek foreign employment. Chemistry and mathematics are offered with the muds program, giving the first-year student a well-rounded program.

Classes Get Rigging-Up Work

The second-year class assembles a rig with a V-door and use both a steam and power unit. A study of industrial engines is added to the curriculum. The drilling crew works 4 hours each day on the rig.

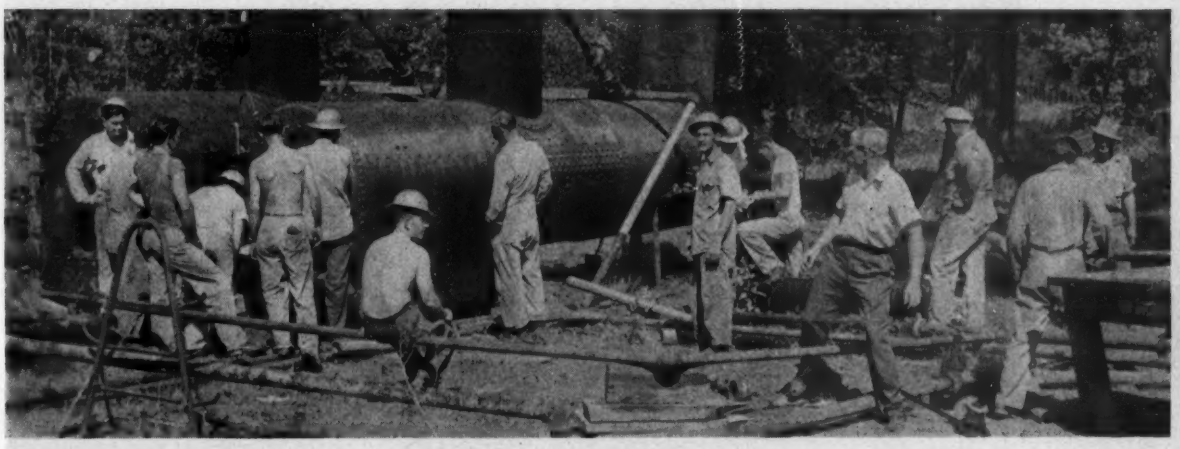
One mile south of the campus a location has been obtained and the derrick has been erected. The crown block and rotary have been set. Draw works, a 12 by 12 steam engine, and the substructure have been installed, and the mud pits have been dug and the pump has been put in place. The steam and water lines have been laid, (despite the critical shortage of pipe)and the boilers have been set and hooked up.

The second-year class will drill a 200 or 300-ft. hole for instructional purposes. The operation of rotary-drilling equipment used to drill oil and gas wells, and rudimentary knowledge of cable-tool drilling operations, will be taught by Leo A. Bell, professor of drilling-practices courses.

The safety bulletin published by the American Association of Oilwell Drilling Contractors is used as a basis for the study of the theory of safety, and under the direction of Bell, safety devices are employed on the rig. Each man is covered by an individual policy which gives him 24-hour protection. The drilling students are issued steel helmets and steel-toe drilling boots.

The main parts of the rig have been furnished by Delta Drilling Co., of Tyler, Robert M. Bass of Kilgore, Roger Lacy of Longview, and Kilgore Boiler Works of Kilgore. Gulf Oil Corp. and Shell Oil Co., Inc., donated pipe, connections, and other critical equipment. Burners for the boilers, 2 and 3-in. unions, mud guns, steam safety valve, steam-gage protectors, and boiler blowoff valves were made available by Well Equipment Co. of Houston. Reed Roller Bit Co. loaned bits for demonstration and use; also a weight indicator and a wire-line core barrel were included.

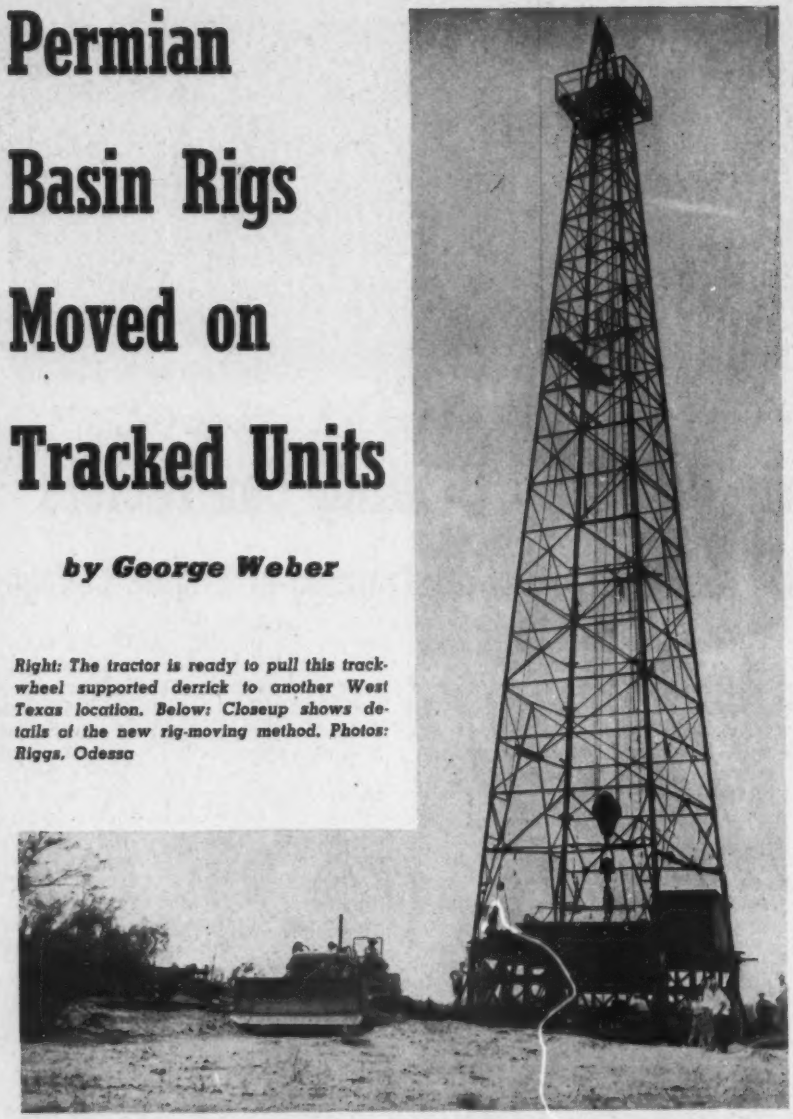
Randolph Watson, director of vocational education, would appreciate and can make available to the class any material or supplies which any drilling-supply company might submit.



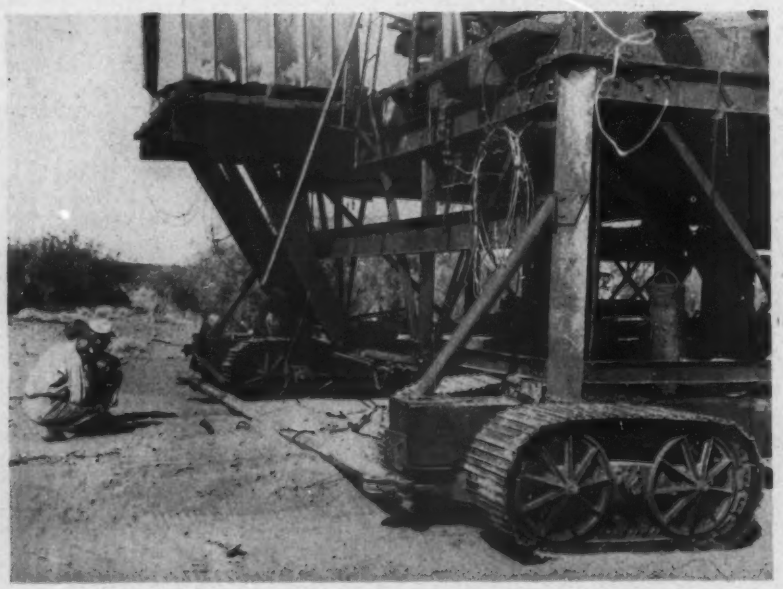
Best procedures involved in steam-drilling operations are taught (gasoline, diesel, and electric rigs are also covered)

Permian Basin Rigs Moved on Tracked Units

by George Weber



Right: The tractor is ready to pull this track-wheel supported derrick to another West Texas location. Below: Closeup shows details of the new rig-moving method. Photos: Riggs, Odessa



RIG moving is expedited to a marked degree in West Texas by R. C. Rumbaugh & Sons, Odessa rig contractors, who employ track-wheel units in place of the usual skidding equipment. Derrick and unitized engine assembly are separated and moved in two loads with all equipment left intact.

Each tracked unit, or dolly, comprises a pair of four-wheel track-laying assemblies supporting a low cradle. The load rests on a revolving circular plate which allows free change in direction of movement. After the four corners of the load are jacked up and the dollies secured in place, the two leading units are left free to turn right or left, and the two trailing units are locked in directional position. A rigid steel tongue, fixed to the two leading units, connects to the drawbar of the prime mover. The load follows the tractor without individual steering at each corner. A right-angle turn is possible in 160 ft. of travel.

The units feature maximum flotation and easy movement in traversing soft terrain. Each track, 20 in. wide, is in contact with the ground over 60 in., thus distributing a total load over 67 sq. ft. of ground contact. As a result, a D-6 tractor can handle heavy loads even through soft sand at road speed and winching is not required. Actual traveling speed between locations has reached a top of 9 m.p.h., averaging about 4 m.p.h.

The new units were designed by Gene Brumbaugh before the war, but materials shortages prevented their fabrication until this summer. The heavy-duty wheels were manufactured by Athey Manufacturing Co. of Chicago and the assemblies were fabricated by Texas Flange Co. of Odessa. Two sets of tracked units are now in use; the original four, rated at 15 tons each, and a new set which will handle loads up to 120 tons.

Since beginning operations in August, the contractors have moved 16 rigs in Goldsmith, Keystone, and Fullerton fields and the Sand Hills area. The heaviest load, 160,000 lb., was moved ¾ mile through relatively soft sand in 25 minutes. The greatest distance covered to date is 2½ miles. Depending on the distance of a move, time saved in displacing a rig in this manner as compared with regular skidding methods, is estimated to range from 2 to 10 days. Nearly all jobs to date have been for drilling contractors, who account for over 90 per cent of all rotary-drilling activity in the Permian basin. The rig contractors plan to extend their service to include the Gulf Coast when added equipment is available.

(For another Journal article on moving West Texas rigs, see "Rolling Heavy Rigs on Wheels" by George Weber, August 2, 1947, page 58; and for special rig-moving in California, see the material in the Journal issue of September 6, 1947, page 43.)

Mr Drilling Contractor—

Do you know how much money you have made or lost within 5 days after completing a contract? The author, who is assistant drilling superintendent, Helmerich & Payne, Inc., describes a simple and quick accounting system which supplies this information.

This system does not follow standard accounting procedure and is not intended to replace it, but rather is a simple method of obtaining a quick profit and loss statement on a contract. Information for preparing the statement is obtained from strip logs (see article, page 138), the daily drilling report, and invoices on the job.

A feature of the system is the fact that maintenance costs are prorated over the life of a piece of equipment, and thus not necessarily charged to the job on which maintenance becomes necessary. For example, a rig may have completed nine contracts with negligible maintenance costs, but is in such poor condition by the time it reaches the tenth job that major repairs become necessary. Obviously, to charge all the repairs to the tenth job does not give a true picture of the costs. Hence, the Helmerich & Payne system prorates the cost of these repairs over the 10 jobs

The logic behind this is simple. For example: Suppose you drove your 1939 Ford to Fort Worth and had a major breakdown en route which cost you $100. Prior to your return, a friend asks you what you would charge him to ride back with you. You say, "Well, it cost me $5 for gas and $100 for repairs on the way down, so I'll have to charge you $105 for the return trip which is what the trip down cost me." The fallacy of such reasoning is obvious.

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COMPLETED Oct. 1, '47
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DRILLING TIME	50	DAYS
FISHING & TROUBLE	5	"
DAY WORK	5	"
OVERALL OPERATING TIME	60	"
DRILL PIPE USED	50	"

RIG No. 31

	COST TOTAL	COST PER DAY
SUMMARY OF COST		
LABOR INSURANCE & SOC. SEC.	12000.00	
FUEL	3600.00	
LUBRICANTS	600.00	
SUPPLIES	1200.00	
MAINTENANCE & REPAIRS 60 D...		
MISCELLANEOUS		
DEPRECIATION		
RIG 60 DAYS AT		
D.PIPE 50 DAYS AT		
OVERHEAD 60 DAYS AT		590.00
BITS REAMERS AND COREHEADS		
WATER		
MUD		
DERRICK CELLAR PITS & LUMBER	2100.00	
FISHING TOOLS & EPENSE	500.00	
MOVING	2000.00	
OTHER COSTS: Roads and grading	1000.00	
Cement and service	500.00	
	51800.00	
EARNINGS		
FOOTAGE 6100' @ 8.50	51850.00	
DAYWORK 5 days @ 600.00	3000.00	
OTHER		
	54850.00	
NET PROFIT OR LOSS	3050.00	
TOTAL COST		51800.00
LESS COST OF DAYWORK 5 DAYS AT 590.00	2950.00	
EXTRAS BILLED		2950.00
NET COST OF FOOTAGE		48850.00
AVER. COST PER FT.		8.00

EXAMPLE OF PROJECTION:
Total labor accounted for:
1-47 TO 15-47 9200.00
Drilling reports show 14 days w/full crews not accounted for
14 days at 200.00 2800.00
TOTAL LABOR ON JOB 12000.00

Simplified

Cost-Accounting Check System

for Drilling Contractors

by Robert E. White

CONTRACTORS are giving more and more attention to intelligent and scientific cost estimating and bidding. This brief description of a very simple and successful cost accounting system is offered for the benefit of those who find that by the time they get the mess untangled it is too late anyway, so what the heck.

Its three cardinal virtues are realism, simplicity, and speed. It requires a fist full of 5-cent file jackets, a Big Chief tablet, a 50-cent slide rule, and all the common sense that can be mustered.

The system has withstood the ravages of a boss who always wants the answer yesterday, and raises the dickens if the answer is not right.

The method has a background of 25 years, with the underlying principles having been established by Walter H. Helmerich who applied his pre-World War I experience as a manufacturing-cost and production analyst to his newly founded drilling business.

System Starts When Contract Is Awarded

The American Association of Oilwell Drilling Contractors has done a good job of education on the elements of drilling cost. These elements will not be reviewed as they are well understood by almost everyone in the business. This article is concerned only with a simple method of handling drilling-cost elements so that the approximate total cost can be determined quickly after each contract is completed. Suffice it to say that for this discussion the term "operating expense" means all costs, regardless of nature, other than maintenance of equipment, depreciation, and overhead.

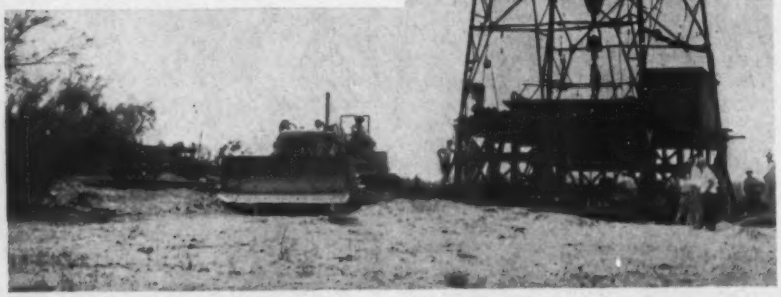
When a contract is secured, a file is set up to receive a copy of each item of operating expense in connection with the job. These copies are

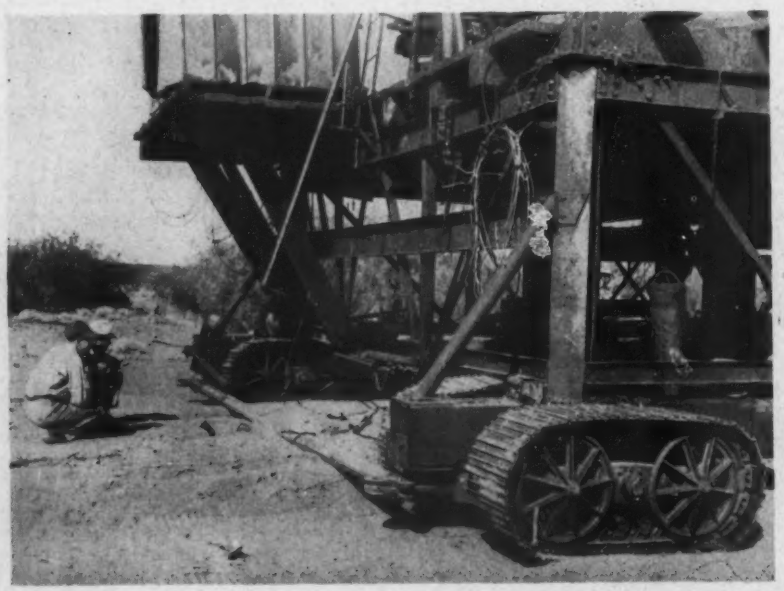
The setup at the left illustrates how the cost-accounting "check system" can quickly tell the profit or loss score for a drilling contract

Permian Basin Rigs Moved on Tracked Units

by George Weber

Right: The tractor is ready to pull this track-wheel supported derrick to another West Texas location. Below: Closeup shows details of the new rig-moving method. Photos: Riggs, Odessa





RIG moving is expedited to a marked degree in West Texas by R. C. Rumbaugh & Sons, Odessa rig contractors, who employ track-wheel units in place of the usual skidding equipment. Derrick and unitized engine assembly are separated and moved in two loads with all equipment left intact.

Each tracked unit, or dolly, comprises a pair of four-wheel track-laying assemblies supporting a low cradle. The load rests on a revolving circular plate which allows free change in direction of movement. After the four corners of the load are jacked up and the dollies secured in place, the two leading units are left free to turn right or left, and the two trailing units are locked in directional position. A rigid steel tongue, fixed to the two leading units, connects to the drawbar of the prime mover. The load follows the tractor without individual steering at each corner. A right-angle turn is possible in 160 ft. of travel.

The units feature maximum flotation and easy movement in traversing soft terrain. Each track, 20 in. wide, is in contact with the ground over 60 in., thus distributing a total load over 67 sq. ft. of ground contact. As a result, a D-6 tractor can handle heavy loads even through soft sand at road speed and winching is not required. Actual traveling speed between locations has reached a top of 9 m.p.h., averaging about 4 m.p.h.

The new units were designed by Gene Brumbaugh before the war, but materials shortages prevented their fabrication until this summer. The heavy-duty wheels were manufactured by Athey Manufacturing Co. of Chicago and the assemblies were fabricated by Texas Flange Co. of Odessa. Two sets of tracked units are now in use; the original four, rated at 15 tons each, and a new set which will handle loads up to 120 tons.

Since beginning operations in August, the contractors have moved 16 rigs in Goldsmith, Keystone, and Fullerton fields and the Sand Hills area. The heaviest load, 160,000 lb., was moved ¾ mile through relatively soft sand in 25 minutes. The greatest distance covered to date is 2½ miles. Depending on the distance of a move, time saved in displacing a rig in this manner as compared with regular skidding methods, is estimated to range from 2 to 10 days. Nearly all jobs to date have been for drilling contractors, who account for over 90 per cent of all rotary-drilling activity in the Permian basin. The rig contractors plan to extend their service to include the Gulf Coast when added equipment is available.

(For another Journal article on moving West Texas rigs, see "Rolling Heavy Rigs on Wheels" by George Weber, August 2, 1947, page 58; and for special rig-moving in California, see the material in the Journal issue of September 6, 1947, page 43.)

Mr Drilling Contractor—

Do you know how much money you have made or lost within 5 days after completing a contract? The author, who is assistant drilling superintendent, Helmerich & Payne, Inc., describes a simple and quick accounting system which supplies this information.

This system does not follow standard accounting procedure and is not intended to replace it, but rather is a simple method of obtaining a quick profit and loss statement on a contract. Information for preparing the statement is obtained from strip logs (see article, page 138), the daily drilling report, and invoices on the job.

A feature of the system is the fact that maintenance costs are prorated over the life of a piece of equipment, and thus not necessarily charged to the job on which maintenance becomes necessary. For example, a rig may have completed nine contracts with negligible maintenance costs, but is in such poor condition by the time it reaches the tenth job that major repairs become necessary. Obviously, to charge all the repairs to the tenth job does not give a true picture of the costs. Hence, the Helmerich & Payne system prorates the cost of these repairs over the 10 jobs

The logic behind this is simple. For example: Suppose you drove your 1939 Ford to Fort Worth and had a major breakdown en route which cost you $100. Prior to your return, a friend asks you what you would charge him to ride back with you. You say, "Well, it cost me $5 for gas and $100 for repairs on the way down, so I'll have to charge you $105 for the return trip which is what the trip down cost me." The fallacy of such reasoning is obvious.

WELL OWNER Smith Oil Co. STARTED Aug. 13, '47
COMPLETED Oct. 1, '47
DEPTH 6100 Ft.

Jones LEASE WELL Nº 1 Blank CO. Kansas

DRILLING TIME	50	DAYS
FISHING & TROUBLE	5	"
DAY WORK	5	"
OVERALL OPERATING TIME	60	"
DRILL PIPE USED	50	"

RIG Nº 31

SUMMARY OF COST	TOTAL COST	PER DAY
LABOR INSURANCE & SOC. SEC.	12000.00	
FUEL	3600.00	
LUBRICANTS	600.00	
SUPPLIES	1200.00	
MAINTENANCE & REPAIRS 60 D[illegible] T		
MISCELLANEOUS		
DEPRECIATION		
RIG 60 DAYS AT		
D.PIPE 50 DAYS AT		
OVERHEAD 60 DAYS AT		590.00
BITS REAMERS AND COREHEADS		
WATER		
MUD		
DERRICK CELLAR PITS & LUMBER	2100.00	
FISHING TOOLS & EPENSE	500.00	
MOVING	2000.00	
OTHER COSTS: Roads and grading	1000.00	
Cement and service	500.00	
	51800.00	
EARNINGS		
FOOTAGE 6100' @ 8.50	51850.00	
DAYWORK 5 days @ 600.00	3000.00	
OTHER		
	54850.00	
NET PROFIT OR LOSS	3050.00	
TOTAL COST		51800.00
LESS COST OF DAYWORK 5 DAYS AT 590.00	2950.00	
EXTRAS BILLED		2950.00
NET COST OF FOOTAGE		48850.00
AVER. COST PER FT.		8.00

EXAMPLE OF PROJECTION:
Total labor accounted for:
1-47 TO 15-47 9200.00
Drilling reports show 14 days
w/full crews not accounted for
14 days at 200.00 2800.00
TOTAL LABOR
ON JOB 12 000.00

Simplified

Cost-Accounting Check System

for Drilling Contractors

by Robert E. White

CONTRACTORS are giving more and more attention to intelligent and scientific cost estimating and bidding. This brief description of a very simple and successful cost accounting system is offered for the benefit of those who find that by the time they get the mess untangled it is too late anyway, so what the heck.

Its three cardinal virtues are realism, simplicity, and speed. It requires a fist full of 5-cent file jackets, a Big Chief tablet, a 50-cent slide rule, and all the common sense that can be mustered.

The system has withstood the ravages of a boss who always wants the answer yesterday, and raises the dickens if the answer is not right.

The method has a background of 25 years, with the underlying principles having been established by Walter H. Helmerich who applied his pre-World War I experience as a manufacturing-cost and production analyst to his newly founded drilling business.

System Starts When Contract Is Awarded

The American Association of Oilwell Drilling Contractors has done a good job of education on the elements of drilling cost. These elements will not be reviewed as they are well understood by almost everyone in the business. This article is concerned only with a simple method of handling drilling-cost elements so that the approximate total cost can be determined quickly after each contract is completed. Suffice it to say that for this discussion the term "operating expense" means all costs, regardless of nature, other than maintenance of equipment, depreciation, and overhead.

When a contract is secured, a file is set up to receive a copy of each item of operating expense in connection with the job. These copies are

The setup at the left illustrates how the cost-accounting "check system" can quickly tell the profit or loss score for a drilling contract

furnished by the general accounting department at the earliest possible moment after the invoices have been received and properly processed for payment. They are filed at random, as no analysis is made until it is time to make the cost sheet itself. At the time this file is opened, a simple record is established to account for time and bits consumed on the job. The strip log (see article on page 138) serves this purpose well, as it gives a picture history of the job to bring out any unusual features which might affect cost.

On ordinary jobs for which no cost data are required until contract completion, a cost sheet is prepared immediately after the drilling job is invoiced. This cost sheet is ready only a few days after the rig is torn down. By using the predetermined or "standard" maintenance costs which are explained later, a complete cost sheet can be prepared in a very few minutes.

For clarity, the major features of cost are explained in detail. The procedure follows these steps:

Preparation of Cost Sheet

1. Determine from records of the job, such as daily drilling reports or the strip log the items below, and record on a simple cost sheet form:

a. Total operating time on the job in terms of days.

b. Total days drill pipe was in use.

c. Total bits, reamers, and coreheads consumed on the job.

d. Depth drilled.

e. Equipment used (rig number or other description).

f. Unusual conditions on the job that affect cost.

2. Sort the invoices and memos in the job operating-cost file into desired groupings. The fewer groupings or features of cost, the better, as long as enough analysis is made to permit an intelligent conclusion. The following features are used in this system:

a. Moving.

b. Labor, insurance and social security.

c. Bits, reamers and coreheads.

d. Fuel.

e. Lubricants.

f. Water.

g. Supplies.

h. Mud.

i. Derrick, cellar, pits, and rig up lumber.

j. Fishing tools and expense.

k. Miscellaneous.

l. Maintenance and repairs.

Run adding-machine tapes on each above group and be sure that each group is complete. In this respect it is frequently necessary to project costs which have not yet cleared the office. This is done by examining purchase orders or delivery tickets not yet matched with invoices, or in the case of fuels and lubricants, etc., estimating the cost for the period between the last invoices accounted for and the completion of the job.

3. Record the total for each feature on the cost sheet, considering each for accuracy and completeness —for example:

a. Labor, insurance, and social security. Total all labor memos in this group, plus the cost of all labor, etc., not yet handled by the payroll department. This can be accurately projected by examining the daily drilling reports or time sheets.

b. Bits, reamers, and coreheads. Determine cost by pricing bits, etc., actually used on the job. Source of information is the standard bit record kept on the rig floor or the daily drilling reports or strip log. Prices are determined from the invoices in this group or from catalogs.

c. Fuel. Total all fuel bills in this group. If all the bills are not in, which can be determined from the dates of the deliveries, and if purchase orders or delivery slips are not available, this feature can be projected from predetermined factors for the equipment used.

Each feature of operating cost is handled similar to the above. It is helpful to discuss each item with the man who supervised the job to insure completeness and accuracy.

Use of Average Maintenance Costs

The maintenance and repair item is handled by a predetermined fac-

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tor or standardized method. This is a high-powered way of saying that instead of charging jobs with maintenance costs if, as, and when they occur, the job is charged with an "average" maintenace cost for each day that it runs. These averages are determined by a simple and direct procedure which calls for very little clerical work.

A file is set up for each rig, and copies of all maintenance items are filed here as they occur instead of in the job file. Periodically the rig-maintenance invoices are removed, examined, and totaled. This total is divided by the number of days the rig operated during the period covered, and the result is the average daily maintenance cost for the period.

This procedure can be expanded by way of analysis to any degree desired. It has proved sound, and overcomes many disadvantages experienced by those who charge jobs with maintenance costs if, as, and when they occur. It calls for a little research when the system is first installed and careful watching to reflect current conditions.

Rig depreciation is charged on an operating-day basis, which is the usual practice. The custom of Helmerich & Payne in replacing rigs at the proper point on their curve of economic decline has furnished a wealth of data to substantiate the rates being used. A study of a recent modernization program, which involved the replacement of 10 rotary rigs, revealed the fact that depreciation rates used were within 4½ per cent of correct.

The daily usage factor is also used for drill-pipe depreciation. This calls for considerable research to establish rates for various depth wells by areas. These rates take into consideration the depth of hole drilled, the general conditions in the area, and the type and cost of pipe and joints in use. They are, of course, based on past experience, and are kept current by periodic appraisals of the pipe and joints. The rates vary greatly from area to area and from depth to depth. The method has proved very successful and can be used for tax purposes if so desired.

How Much "Overhead" to Use

Overhead burden — all operating and administrative costs not otherwise accounted for—must be recovered in this feature. This item is also handled by control files containing copies of all such costs for a period, by areas. The total of these costs divided by total operating days for a period results in the average cost per day. These averages are adjusted as frequently as necessary to reflect true current costs by areas. Each contract bears its share of this burden in proportion to the total operating days on the job.

After adding other pertinent information such as income received, total cost, net profit or loss on job, average cost per foot, and average cost per day, the complete cost sheet is ready for the typist and the scrutiny and criticism of all concerned, especially the drilling superintendent—who always says it couldn't possibly have cost that much. Total time required to prepare the sheet is usually only from 15 to 30 minutes.

A quarterly audit by a topflight public-accounting firm embraces a careful examination of the cost records as well as the financial records. The degree of accuracy insisted upon by the management and the accounting firm leaves little to be desired.

The system also permits the determination of cost at any point during the drilling of the well. It also relieves the financial accountant of a great deal of routine analysis in his records. A total job control is all that is necessary. Its simplicity and speed are best demonstrated by the fact that the entire setup requires but a very small portion of one man's time to handle all the cost work for up to 20 and more rotaries and several cable-tool outfits with no clerical help. And—accurate cost sheets are available within a few days after the completion of a job."

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California Hosts

(Continued from page 110)

GENE REID DRILLING, INC.,

Bakersfield

STARTING out in 1943 with one drilling rig, this fast-moving firm is now operating seven portable rotary rigs. Another new rig addition, with diesel engines, also has just been purchased. "Gene" Reid, president and general manager, started as rotary helper in 1916 at Maricopa and worked up to derrick man and finally driller before enlisting in the Navy in World War I. He returned as driller for Havenstrite & Baker, at Maricopa and Taft—drilled for various contractors during the Signal Hill boom—pushed tools and was general superintendent for Taft Well Drilling Co.—and in 1938 became general superintendent for Termo Co. at Long Beach. Vice president and general superintendent for Reid's firm is R. L. "Bob" Barnett; business manager is W. E. "Bill" Kinney. The parent company has two other organizations: Rocket Petroleum Co. with 10 producing wells to its credit, and Gene Reid Exploration Co., an organization for wildcatting and general exploration. This contracting company has recently completed an extensive tool yard, warehouses, and office facilities on Pierce Road in Bakersfield.

R. L. BARNETT *E. C. REID*

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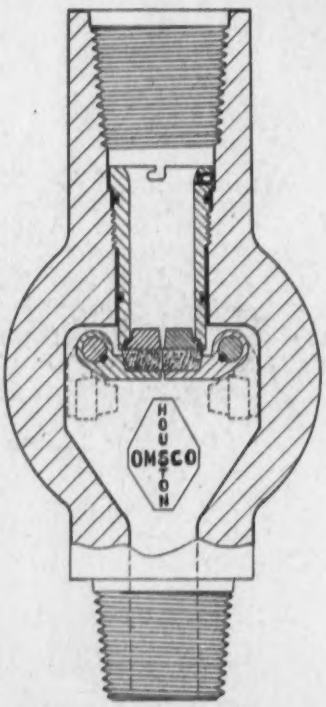

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CLYDE HALL AND JACK BECKHAM

CLYDE HALL DRILLING CO.,

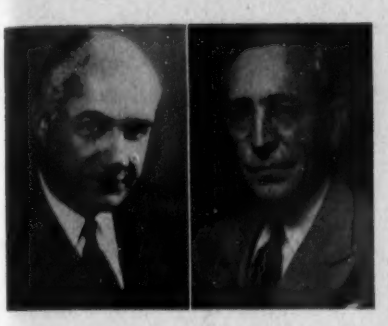
Oildale

THIS energetic newcomer started out March 24, 1946, and in addition to its contract activities, has gotten into oil production at Santa Maria and Bakersfield. Drilling foremen are Earl Hume at Santa Maria and Ray Ferguson at Bakersfield. Operated are two portable rotary drilling rigs in 4,000 to 8,000-ft. digging. Rig. No. 1 has a 97-ft. mast with 375,000-lb. capacity, uses a 7¼ by 14-in. pump, has been used successfully at 5,500 ft. Rig No. 2 with a 126-ft. cantilever mast of 370,000-lb. capacity, is equipped with a diesel-powered draw works, and a 7¾ by 16-in. main pump, has worked successfuly at 8,000 ft. Both rigs are equipped with new 4½-in. A.P.I. shrink-grip pipe.

DRILLING AND EXPLORATION COMPANY, INC.,

Los Angeles

DRILEXCO started in 1929, with one rotary rig operating in Venezuela. Operations in the United States began in 1930. Since that time Drilexco has operated as drilling contractors and as a producing company in Pennsylvania, East Texas, Texas Panhandle, California, New Mexico,



J. E. BRANTLY *R. W. MARSHALL*

and in Canada, Peru, Brazil, Venezuela, Paraguay, and Turkey. Currently the company is operating 26 rotary rigs throughout its various divisions. Key personnel includes the following: J. E. Brantly, president, Dallas; Ralph W. Marshall, vice president, Los Angeles; D. A. Powell, vice president, Hobbs, N. M.; R. E. Watson, vice president, Dallas; J. H. Lewis, vice president, Rio de Janeiro; E. H. Clayton, vice president, Ankara, Turkey; G. E. Peterson, vice president and treasurer, Dallas; H. A. Peterson, secretary, Dallas; W. W. March, assistant treasurer, Dallas; E. R. Caldwell, assistant secretary, Los Angeles; O. L. Pack, resident manager, Bahia, Brazil; J. A. Hoagland, resident manager, Asuncion, Paraguay; R. C. Reniers, resident manager, Ankara, Turkey; R. L. Rose, petroleum engineer, Los Angeles. The California division of the company operates exclusively as a drilling contractor and has drilled upwards of 335 wells in the state. The average depth of the wells drilled during 1946 was 11,500 ft.

E. H. JONES *J. D. BRYAN*

HARBOR PRODUCTION CO.

Los Angeles

THIS concern was organized in 1947 for oil-well servicing and maintenance work in the Los Angeles Basin. Yard and field office is located at 1260 Coil Avenue, Wilmington. In 1943 the company purchased its first drilling rig, with J. D. Bryan manager of the drilling department. Emmett H. Jones, president, has been actively engaged in the oil business since 1930. He also is president of Interstate Petroleum Corp. with production at Wilmington-Long Beach.

CALIFORNIA HOSTS

C. L. FOWLER *C. T. GATES*

FOWLER DRILLING CO.

Long Beach

IN 1940 this partnership was organized by C. L. Fowler and C. T. Gates, each of whom has had 30 years' experience in drilling and maintenance work. The company began with the operating of one string of tools on remedial work in the Long Beach-Los Angeles harbor area, and has since operated from one to five strings almost continuously in

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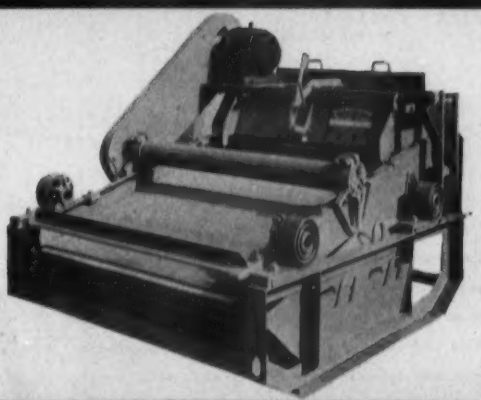

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this area. It is now operating four strings of tools. In the Seal Beach area in 1944 it established a then record for slant drilling. The hole was carried to 7,400 ft., but the actual vertical depth was only 5,000 ft.—the other 2,000 ft. being "slant hole." It has operated in most of the fields in California, and in Oregon, having drilled some 60 wells in the San Joaquin Valley and 87 wells in West Newport field. Its key operating personnel, all of whom have been with the company since its inception, are C. W. Grother, E. L. Barlow, O. D. Chase, and R. D. Faulkenbery.

HAYES AND SPRAGUE, INC.

Los Angeles

STARTING as a California corporation in May 1946, this contractor has worked on the drilling of intermediate and deep wells with power outfits. The start was made with one rig, then was added a new heavy-duty outfit powered with three diesel engines of 650 hp. each. The latter is a new development in deep-drilling work, and represents the first time a heavy-duty power outfit had been put together with adequate horsepower in few units. Both outfits are in continuous and satsfactory operation, with the new big job presently engaged on a deep test projected for 13,000 ft. R. P. Sprague of the firm (former general superintendent for Loffland Brothers in California) has had long and varied experience in drilling deep wells and has built an organization of foremen and drilling crews thoroughly competent for such work. He and A. S. Hayes, have had extensive experience in the operation of electrically powered rigs, particularly in closely built up residential areas.

A. S. HAYES *R. P. SPRAGUE*

K. L. KELLOGG & SONS.

Compton

FOURTEEN strings of tools run in California for this organization which was organized in 1943 as an outgrowth of K. L. "Karl" Kellogg's long-time contracting business as an individual. Under "K. L." as general manager are his three sons, Joe (petroleum engineer and assistant general manager), Forrest (drilling superintendent to the Los Angeles basin and coastal area), and Dick (drilling superintendent for the Bakersfield area). "K. L." was born at Bradford. Pa., and began his oil-field work in 1910 on a cable-tool rig, carrying a tin lunch pail, swinging a 16-lb. sledge, walking 4 miles to work and getting $3.50 for a 12-hour day.

K. L. KELLOGG

HENRY S. TENNY, DRILLING CONTRACTOR.

Torrance

THIS organization started in 1939 and runs two rigs—deep-well equipment—in active California areas. J. E. (Dick) Pettijohn is manager and

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KEEPS DRILLING MUD CLEAN — PROVIDES TRUE SAMPLES OF CUTTINGS

J. E. PETTIJOHN

has been in the drilling and oil-production business since 1910; also associated with the firm is H. C. (Sparky) Cowan.

DUNLAP & GRAHAM,

Long Beach

SIX strings of tools are operated by partners D. H. Graham and D. D.

D. H. GRAHAM

Dunlap. Graham has been in California oil activities for 25 years, starting into the oil fields in Texas at the age of 15 and working on cable tools around Wichita Falls, Ardmore, and Henrietta. In 1916 he went with Oil Well Supply Co. in Tulsa as a store clerk, but returned to Texas during the Ranger boom as a drilling superintendent. After his move to California in 1922 he became owner of Atlas Supply Co. at Bakersfield; in 1939 he went into drilling with Dunlap.

ROCKY MOUNTAIN DRILLING CO.,

Los Angeles

THIS prominent West Coast operator is spread out with 16 rotary rigs through California, Wyoming,

D. E. STRAITIFF

and Washington. Two district offices and tool yards are maintained, at East Los Angeles and Bakersfield, and a field office at Rock Springs, Wyo. Rocky Mountain started out with three rigs in Wyoming in 1931, and worked the Rocky Mountain area until 1939. Then headquarters were moved to California. This contractor has dug some deep holes "out west." Among the records hung up has been 4 Mushrush at 13,135 ft. total depth at Wasco, Calif. This was for Standard Oil Co. of California in 1940—and at the time the deepest well ever drilled under bottom-hole contract. Just recently the firm completed 3 Unit at Church Buttes, Wyo., for Mountain

CALIFORNIA HOSTS

Fuel Supply Co., at 13,063 ft. total depth. This is not only the deepest well ever drilled in Wyoming and the Rocky Mountain region, but made the deepest producing well there. Dorsey E. Straitiff is president, L. A. Whipple, Jr., vice president and drilling superintendent, Daniel A. Noonan, Jr., secretary-treasurer.

SANTA FE DRILLING CO.,

Santa Fe Springs

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CALIFORNIA HOSTS

of the drilling equipment owned by Union Oil Co., which consisted of nine drilling strings and three repair strings. Majority of the 300 present employes formerly were with the drilling department of Union. Santa Fe has grown now to operate 13 drilling and 2 repair strings throughout California. An interesting fact is that of the 64 company stockholders, more than 40 are company drillers. J. D. Robinson is president, R. A. Powell, secretary-treasurer, and directors include H. P. Wickersham, Frank Gess, Howard Robinson, Leo Goss, G. A. Henry (all active superintendents, foremen, or drillers).

J. D. ROBINSON

CAMAY DRILLING CO.

Compton

COMPANY'S officers are Tyler F. Woodward, president, E. R. Love, vice president and general manager, Howard C. Christie, vice president, Robert G. Bundy, secretary-treasurer. Willis Klassen is California superintendent. Tool pushers are: Ray

E. R. LOVE

Forker, W. J. Carlton, William Lloyd, Milt Allen, James Waddill, Eli Pratt. Camay operates eight modern and complete rotary outfits through California. Contracts vary from shallow to deep-zone jobs and many directional wells have been efficiently slanted out under the Wilmington harbor area.

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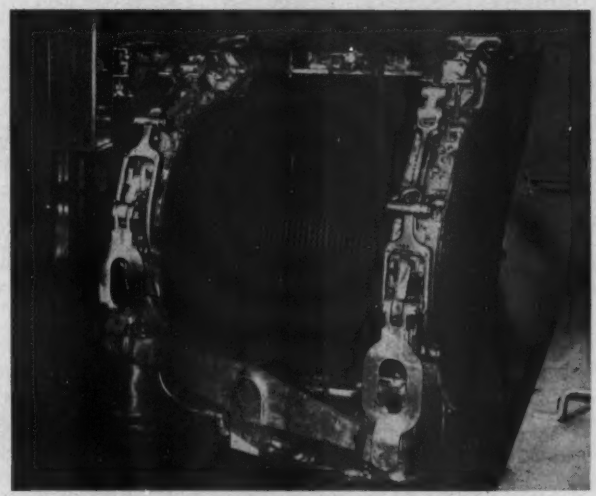
Long Beach

ORGANIZATION was formed June 15, 1946, by E. R. Norris, presi-

E. R. NORRIS

dent, and E. J. Simonis, secretary and treasurer. Norris and Simonis formerly were employed by Kern Drilling Corp., Norris as superintendent, and Simonis as office manager. On September 1, 1947, Santa Maria spudded its fifty-seventh well. Most of the drilling activity has been in the Santa Maria area. At the present time six strings of tools are operated. When Norris was asked what his hobbies were he replied. "Drilling oil wells—because the hours are short, the work is easy, the pay is good, and a drilling contractor never has any trouble." Boating and deep sea sport fishing is the hobby followed by Simonis.

..OF DRAW WORKS BRAKE AND KELLY FEED OFF . . .



After installation, the Kinzbach Braking and Feed-off unit becomes an integral part of the hoist, with only a small amount of floor space required for the Main Control Cabinet. With the exception of this and the Feed-Off Control Manifold place above the throttle, all parts of the unit are within the regular drum guard. There is no appreciable increase in the weight or bulk of the hoist . . . no change in normal rig arrangement is necessary and the rotary may be driven from the draw-works in the customary manner. The manual brake lever remains in operative position and may be applied at any time.

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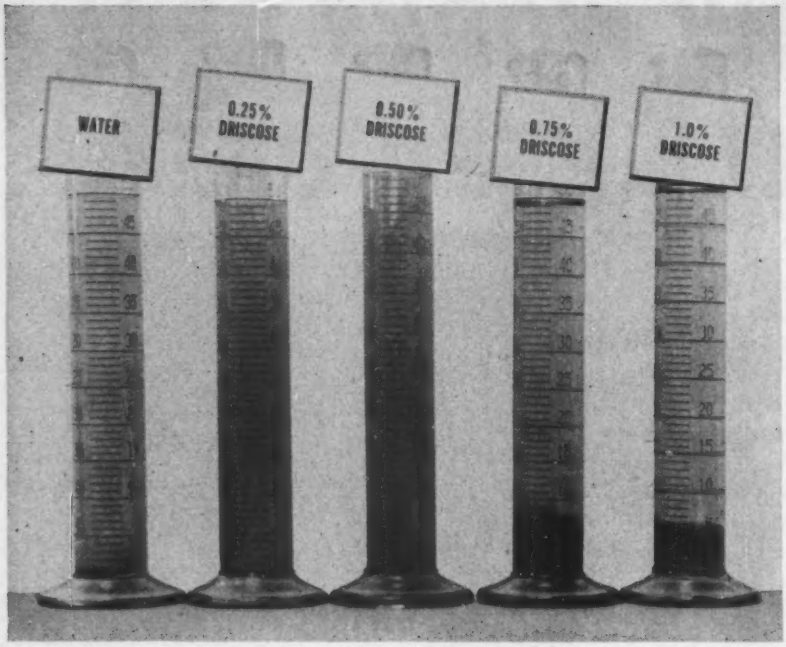

Fig. 1—Bentonite pellets after immersion for 6 days, then agitated by rotation of cylinders

Practical Application of

Carboxymethylcellulose In Drilling Muds

by J. R. Pettigrove*

OPERATORS are faced with innumerable problems connected with deeper and more difficult drilling. One of these problems is the necessity of finding a better and more economical means of obtaining efficient drilling muds. The search for a solution to this particular problem has resulted in a study of water-soluble celluloses as colloidal agents in drilling-mud systems. This study led to an extensive research program in which the use of Driscose (sodium carboxymethylcellulose) as a new drilling-mud additive was established. Numerous field tests have been made with the product, and its usefulness in drilling muds has proved to be far greater than the most optimistic laboratory observations.

The material is a white granular powder and is immune to both chemical and bacterial action. It is easy to handle and noninjurious to the skin. The material is readily soluble in hot or cold water and will withstand very high temperatures without charring. It is added to the system through the conventional hopper in the same manner as bentonites or barites. No special precautions or equipment are necessary for its use.

Driscose is especially adaptable to drilling either salt or anhydrite formations. Expensive fishing jobs or possible loss of hole can be prevented by using this material. Electrologs are as good if not better than in any other type of mud. Reductions in total mud costs can be achieved by using Driscose as the colloidal material in weighted-mud programs due to both the large savings in weighting agents and treating chemicals. Also, in some cases it is entirely possible to eliminate an intermediate string of casing where such is necessary to protect hole from rock, salt or bentonitic shales.

*Vice president, Drilling Specialties Co., Bartlesville, Okla. This report was presented at the recent meeting of the Southwest Texas Section of the A.I.M.E. at Corpus Christi.

Exhaustive field tests using this product have been conducted in the Gulf Coast and Mid-Continent areas and equal success has been met in regard to both performance and total mud costs. The results of the field data show there are many advantages to be gained by using this new cellulose product as a colloidal material in drilling muds. The more important advantages are discussed in detail as follows:

1. Low water losses and thin filter cakes.—Water losses in the range of 3 to 4 cc. can be attained with very small amounts of Driscose. Generally the addition of a pound to a pound-and-a-half of the material per barrel of mud will be sufficient but the type mud in the system controls the amounts required. In areas where

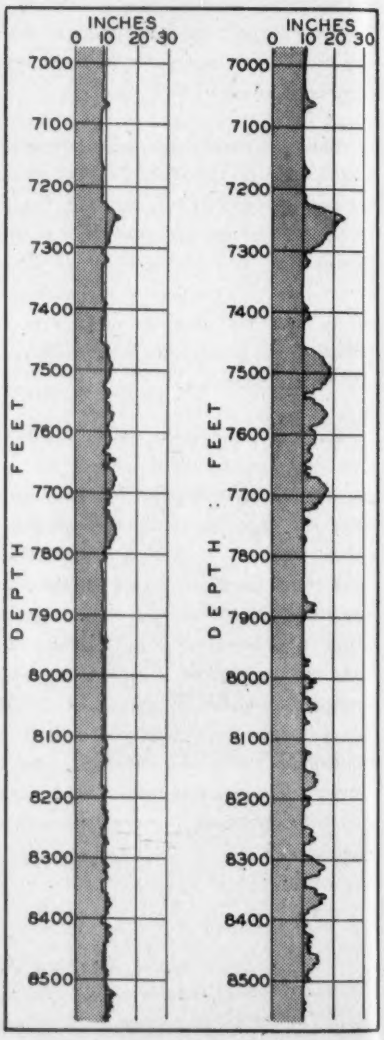

Fig. 2—(Left) Caliper log of Phillips Petroleum Co. 1 Hairston-Johnson, South Tyler field, Smith County, Texas. Starch-base mud from 6,000 ft. to total depth 9,985 ft., weight 14 lb. per gallon. Fig. 3—(Right) Phillips 1 Tray, South Tyler field. Driscose-base mud from 7,000 ft. to total depth 10,568 ft., weight 14.4 lb. per gallon

there are large amounts of clays already present unusually small amounts of Driscose are needed while other areas require more. Field tests have shown Driscose to be over six times more effective in reducing water loss than any other product. This material offers the advantage of a thin strong impervious filter cake the thickness of which ranges from 1/64 to 3/64 in.

An important factor in considering additives for lowering water loss is the amount of material required to maintain the mud characteristics once they are set. Since all colloidal dispersions have a limited life, especially in the presence of strong electrolites, it is highly desirable to use one that retains its useful properties as long as possible. In this respect Driscose is far superior to any other known additive. Its ability to withstand chemical and bacterial action and high temperatures results in a minimum amount required to keep the water loss and filter cake at any desired point.

2. Less weighting material required. Field test data have substantiated laboratory indications that less weighting material is required in Driscose base muds than when any other material for a similar purpose is used. In South Tyler field where it is necessary to carry a 14-lb. mud from 7,000 ft. to a total depth of 10,000 ft. it was found that an average of 5,000 sacks per well of barites was saved. This has also been found to be true in other areas.

The reason for this saving is undoubtedly due to the better suspending properties of Driscose base mud along with the fact that the necessity of "watering back" to lower the percentage of light solids is greatly reduced. The light clay materials from the hole are not readily dispersed in Driscose solutions.

3. Resistance to contamination.—Due to the resistance this colloidal material exhibits toward foreign or undesirable substances such as salt, anhydrite, or cement, a mud which is more easily controlled is obtained by its use.

Anhydrite can be drilled without the usual mud-treating problems and it is not necessary to remove the calcium sulfate from the system. Salt contamination actually simplifies the control of Driscose base drilling muds. The material can be added either before or after pollution with subsequent lowering of water loss to the desired point. This means that in case a well unexpectedly encounters a high-pressure salt-water flow the danger of sticking the drill stem is almost eliminated. Phillips Petroleum Co. 1 Vidrine in South Louisiana penetrated such a flow at a depth of 12,236 ft. At that time the mud did not contain Driscose and the water loss rose rapidly to 186 cc. with chlorides at 60,000 p.p.m. Three thousand five hundred pounds of Driscose was added as quickly as possible and the water loss dropped to approximately 20 cc., also, the drill pipe was not stuck. After the well was killed, the water loss was easily brought down to 6 cc. by further addition of Driscose. From the point of safety, it would have been better to have Driscose in the mud prior to encountering the salt water, but at the time this well was drilled the material was not too plentiful and was being used in emergencies only.

4. Reduced volumes required.—Since it has been found that the required quantities of weighting material, treating chemicals, and the colloidal material itself are greatly reduced by use of Driscose the transportation and storage problem at the well are kept at a minimum. For instance, 2,000 lb. of Driscose are sufficient to drill the average Gulf Coast well on which a weighted mud is carried. Although this is particularly advantageous on offshore or swamp locations a considerable saving is made in drayage expense on any well.

5. Reduction in bentonitic dispersion.—It is highly desirable and economical to obtain a certain amount of clay materials from the shale sections drilled. However, too many of these light solids cause viscosity and gel trouble and the mud then requires

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Fig. 179
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Fig. 180
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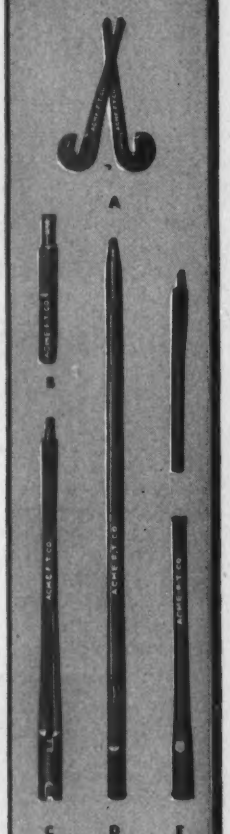

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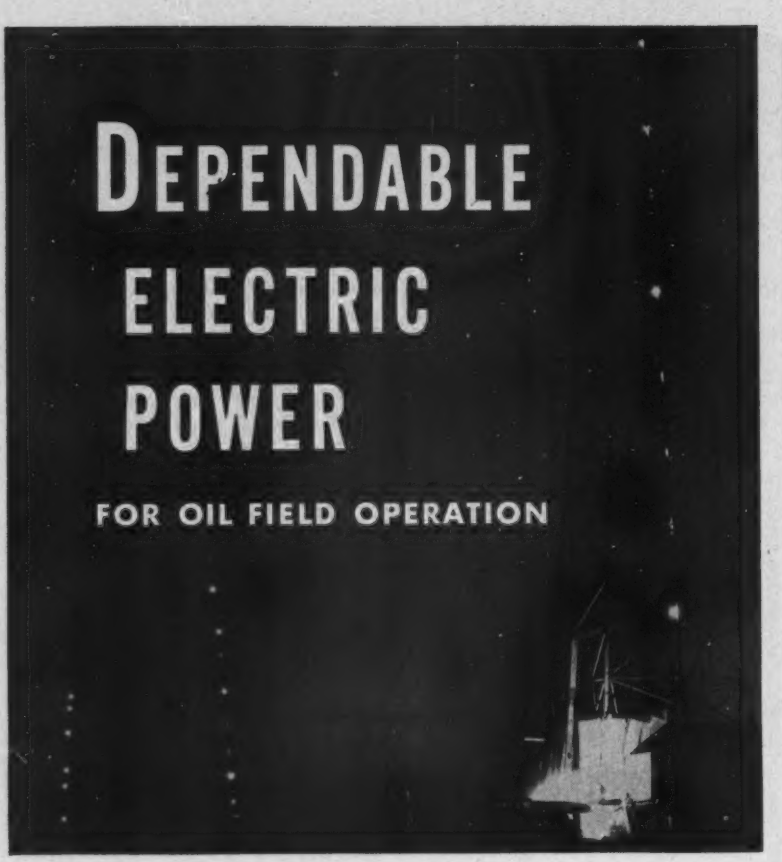

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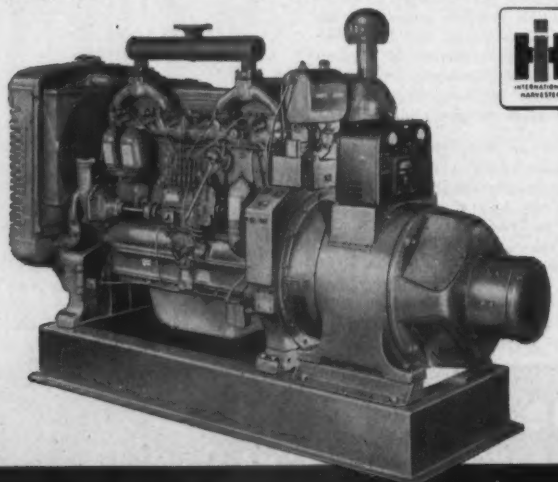

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"watering" to reduce the percentage of such solids. As mentioned before, in weighted jobs this operation is expensive. Driscose base muds considerably relieve this condition due to their resistance against the clay dispersion as illustrated in Fig. 1.

The light solids picked up by the mud come from not only that area beneath the bit, but also from the adjacent area on the walls of the hole. In other words, the hole size is increased due to both washing and the wetting effect of the mud on the formation. This hole enlargement is detrimental to efficient drilling and completion due to:

1. Danger of losing top of "fish" under ledges in case of "twistoffs."

2. More cement than should be necessary is required for casing jobs.

3. Danger of cement channeling increased.

The wetting effect can be controlled within limits by using a Driscose base mud. The proof of this has been obtained in the form of caliper logs as indicated in Figs. 2 and 3.

The composite log shown is a survey of holes in two offset wells in South Tyler field. The same rig, pumps, and crews were on both jobs. One well, the 1 Johnston-Hairston, was drilled from 6,000 ft. to total depth, while the 1 Tray was drilled from 7,000 ft. to total depth using Driscose. Bentonites were used in the two wells above these points. Both were weighted jobs, 14 lb. per gallon, and the other mud characteristics such as water loss and viscosity were similar. From the composite log it can be seen that a hole much nearer bit gage was drilled with the Driscose base. (Note: The logs are shown from 7,000 to 8,500 ft. only, since it is not possible to include more.)

6. Wide application and easy control.—Driscose has been found applicable as a drilling mud additive in every area in which it has been used and indications are that its use can be extended to all other areas where drilling mud problems occur. It can be used to advantage as a colloidal material on either the routine or difficult jobs.

Driscose makes a drilling mud that is very easily controlled. Generally, the only treatment required to maintain viscosity and get strength in the proper range is the addition of caustic soda and quebracho. Sometimes it is necessary to break high gels in muds that have too high a percentage of light solids before the initial addition of Driscose, but this can be accomplished easily and cheaply.

7. Lower total mud costs.—In addition to the advantage of stability, Driscose makes a drilling fluid of excellent characteristics at very low total mud cost. Case histories substantiate this in both the Gulf Coast and Mid-Continent areas. The reduced

mud costs are derived from a savings in required amounts of:

1. Colloidal material.
2. Treating chemicals.
3. Weighting materials.

Besides these economics there are other indirect savings that can be attributed directly to the improved drilling fluid, such as a reduction in amount of cement required for casing, reduced completion time, and less hazard of sticking the drill pipe.

In normal drilling Driscose base muds with a water loss in the neighborhood of 4 cc. average approximately 80 cents per foot of hole. This includes all metal except weighting agents. This average cost per foot was calculated for the hole drilled from the time of initial treatment to the total depth in several wells.

Near Baton Rouge in South Louisiana, Phillips Petroleum Co. drilled the 1 Wilbert using Driscose to a total depth of 10,522 ft. The initial treatment of Driscose was made at 8,600 ft. Although no trouble was encountered, a high-pressure salt-water flow was anticipated. The average mud characteristics were as follows:

Weight	13.5
Funnel viscosity	45
Initial gel	0
Final gel	10
Water loss	4.1
Filter cake, in.	3/64
pH	11.0

The total mud cost on this well was $9,807.63, which included the following material:

Driscose, lb.	900
Caustic soda, lb.	3,975
Quebracho, lb.	4,150
Weighting material, sacks	6,700

The Driscose base mud in this particular case afforded a savings of some $5,000 on the total mud bill. A total of only 900 lb. of Driscose was used on the job, which includes the initial treatment of 525 lb. and the 375 lb. required for maintenance.

In South Tyler field of East Texas the 1 Phillips Tray was drilled to a total depth of 10,568 ft. using Driscose from 7,000 ft. to total depth with a savings of approximately $10,000 over the next best mud bill. The total cost for this 14.5-lb. mud, which it was necessary to carry through the anhydrite encountered in this area, was $20,023.69. For the portion of the hole drilled using chemical treating additives the cost was $4.67 per foot as compared to $6.02 for its nearest rival. This cost incidentally includes all weighting materials, clays, and chemicals.

The foregoing outlines some of the uses and advantages of Driscose base drilling mud that have been tested and proven under actual field conditions. Continuing laboratory research combined with further field testing and experience will undoubtedly establish many other advantages to be derived from the use of Driscose as a drilling mud additive.

Diamond-Bit Coring At Rangely

(Continued from page 142)

100 per cent core recovery has been realized.

Use of the barrel without the inner barrel was tried as a means of increasing the diameter of the core opening through the bit. This narrows the cutting face of the bit, which it is believed, will result in faster cutting. Outer diameter of the bit used is 6⅛ in., the same as that of other diamond bits generally used in the field. The inner diameter, however, was increased from 3⅜ in. to 4⅛ in. The larger core which is cut has some disadvantage in that it is much heavier and more difficult to handle. However, in addition to the possible faster cutting time resulting from the narrower cutting face of the bit, elimination of the inner barrel and its swivel reduces the cost of the barrel materially and also the number of working parts which might give trouble. Actual running of the barrel is no different from with one with an inner barrel. The core simply rides up the shell

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instead of into a nonrotating inner barrel. There was a possibility that with the wear of the rotating outer barrel, the core might become broken up or wobble in the barrel and cause clogging. However, no difficulty was experienced.

To remove the core from a long barrel, the barrel is suspended almost vertically in the derrick with bottom from 1 to 2 ft. off the derrick floor. With the bit and core catcher removed, the core is allowed to drop out the bottom and pieces are broken off by light blows with a hammer. A special manually operated core-holding device is clamped to the bottom of the barrel to prevent the core from dropping out too suddenly or when not wanted. Care must be taken not to allow the core to drop too far at a time or too quickly, as the weight of the column might cause the core to crash through the derrick floor as was done in one instance.

By reduction in number of trips out of the hole through use of the longer barrels, the bit is allowed to remain on bottom for longer periods, which in turn results in increased footage per day. In the first well in which the 90-ft. barrel was run, 679 ft. of section was cored. The over-all time for this was only 8.1 days, with an average of 84.1 ft. per day being cut. This was an increase of 14.3 ft., or approximately 20.5 per cent over the average footage per day made with 50-ft. barrels. The increase is more pronounced over the footage made daily with the earlier 30 and 25-ft. barrels. In the case of coring with conventional heads and barrels, in which the maximum core that could be cut was about 9 ft., the increase in daily footage is even more striking. In this first well cored with a 90-ft. barrel, one trip had to be made to change bits, which added 5 to 6 hours to the over-all time. The bit started in the section previously had been used in another well and was unable to complete the hole, necessitating the running of a second bit.

Also, in reducing the number of round trips, the diamond heads are not exposed to riding on the casing as much, which means less wear on the bits and possibly longer life for them.

Work being done by Stanolind in diamond coring with reverse circulation is a particularly important development. Through this procedure, with a single bit capable of cutting the entire section and by ability to pump the cores to the surface through the drill string as they are cut, it is possible that the necessity for trips out of the hole will be eliminated entirely. The principal obstacle which has had to be overcome so far has been the tendency of cores to become clogged in the string. Essential for the complete success of this operation is the use of a drill string, completely flush internally.

AVERAGE CORING RECORDS WITH DIAMOND BITS

	Reverse circulation (2 wells)	Conventional circulation 90-ft. bbl. (3 wells)	Conventional circulation 50-ft. bbl. (6 wells)
Feet cored	364.5	577	543.7
Days coring	8.8	8.7	9.5
Feet cored per day	54.5	66.5	59.43
Number of bits	1.0	1.23	1.13
Average footage per bit	425	464.3	494.3
Average time (minutes/feet)	7.65	8.5	11

Reverse-circulation diamond coring has been tried by Stanolind in five wells so far, although it has been only in the last two wells that the entire section was so cored, and without any special trouble. Results in the latter wells (B-5 and B-7 F. V. Larson) were considered highly favorable and successful. In the B-5 Larson well, hole of which was completed last May, 399 ft. of section was cored without any trips being made and with 98 per cent recovery being obtained. In the B-7 Larson well, hole of which was completed in August, 390 ft. of section was cored under the same circumstances and with comparable results.

Coring

Coring in these wells was done with a reverse-circulation cleanout rig consisting of a heavy-duty Cardwell draw works with 180-hp. gas engine, a variable-speed gas engine for driving the rotary with a 75-ft. long drive shaft, a 4½ by 10-in. high-pressure pump for fluid circulation, and a four-way manifold with quick-opening plug valves for equalizing or reversing fluid through the tubing or casing. The well-control hookup in each case included a master gate, a blowout preventer, and a Guiberson head for drilling under pressure. A 4⅞-in. o.d. by 2-11/32-in. diamond-core head was used. The drill string was made up of 2½-in. E.U.E. tubing with ferrules inserted at the couplings for greater flush. This was run with five 4⅞-in. o.d. by 2½-in. i.d. drill collars and a 4⅞-in. long by 2-17/16-in. i.d. core breaker sub on bottom above the bit head. On top the string was a core catcher sub with a Hughes Type J catcher and an adapter to a 30-ft. joint of 3-in. tubing which served as an upper core receiver, and which was run just below the 35.6-ft.-long kelly. A pin was inserted across the top of

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the core receiver joint to prevent the core from entering the kelly.

Tubing was used for the drill stem to give more effective pumpability of the cores by reason of its smaller size. This dictated the reduced size of the bit core opening, and in turn the outer diameter of the bit was reduced to provide a narrower cutting face on the bit. and to cut faster.

The core-breaker sub run above the bit containing four balls riding in vertical grooves. With reverse circulation the balls ride high in the grooves away from the core. When the pump is stopped the balls fall and wedge against the core. By raising the string, the cut core is broken off, and then is pumped to the surface, where it is caught in the core receiver. When sufficient core is pumped to the surface to fill the receiver, the string is raised, the core receiver broken out, and the core removed.

Results so far indicate that reverse circulation cores faster than conventional diamond coring with the 6⅛ by 3¾-in. core head generally used, except when the tubing becomes plugged with core. A comparison of average coring records of reverse circulation with those in which 90-ft. barrels and also 50-ft. barrels were used is indicated in the table.

Field Practice

In the diamond bit coring of nearly 100 wells in the past year, effective cutting and maximum life, relatively low and constant rotating speeds, moderate and steady weight on the bit, and relatively low but uniform pump pressures have been found essential. Rotating speeds are limited to from 100 to 125 r.p.m. Weight on bits is maintained between 4,000 and 6,000 lb., depending on the hardness of the formation. Pump pressures are held from 500 to 550 psi.

In starting to core with diamond bits, the bit must be set down easy with face flat with the bottom of the hole. The bit first is rotated about 20 minutes without making hole, and then coring is started with about one point of weight being carried on the indicator for a few minutes. Weight then gradually is increased until the maximum allowed is reached. The same procedure is followed any time coring is started up after a suspension of rotation. Practice in coring is to stay just a little ahead of weight indicator and not to make any quick changes in rotating speeds, weights, or pump pressures. If a foot requires over 45 minutes, the bit stops or pump pressure jumps as much as 100 psi. or more, rotation is stopped and the bit pulled to determine the trouble. In conventional circulation diamond-bit coring, only one drill collar normally is run. Keeping the hole clean is particularly important since any pices of metal dropped in the hole, or any hard uneven surface being cored is likely to tear out the diamond and break the heads.

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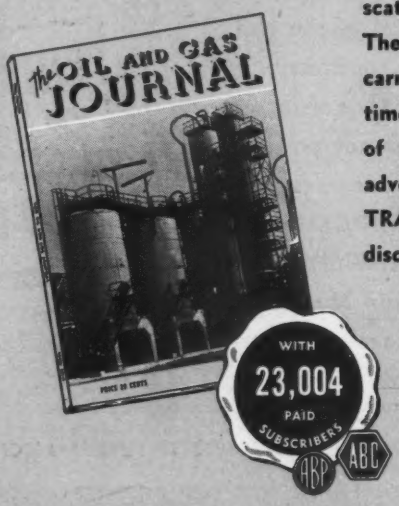

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PAST AND FUTURE OF OIL *Exploration* IN *Rocky Mountain* AREA

by John G. Bartram*

IN 1947, more exploratory crews are working in the mountain country and more money is being spent to locate new reserves than ever before. The reasons, of course, are economic. New oil is in greater demand in the area and can now be sold more readily than in former years.

By 1946 the older-known structures had been fairly well picked over, and the structural areas around the older fields had been shot and combed rather carefully for new extensions or complex structural conditions that might produce oil. The exploration plan then turned rapidly to the search for new anticlines in the Tertiary-filled basins that had not yet been as thoroughly explored. It is believed that the new fields and new reserves of the Rocky Mountains may be largely under these basins.

Although local areas are complex, the geological history of the entire region is fairly simple. During an exceedingly long period of geologic time—from the pre-Cambrian up to and including the end of Upper Cretaceous time—the Rocky Mountain region was generally depressed and covered by sea. A great geosyncline, or trough in the earth's crust extended north and south with its deepest part in eastern Utah and southeastern Idaho. In the earlier geologic periods much calcareous material accumulated in the geosyncline to form thick limestone series with which were interbedded some sandstone and shale. During later periods the sediments accumulated in this geosyncline were predominantly shales with some interbedded sandstones.

Fig. 1 shows the approximate outlines of the Tertiary-filled basins, and it is here that the oil operators are now doing most of their new work. The future of oil exploration in the Rocky Mountains may depend largely on the results. In the Big Horn basin, in Wyoming, three new oil fields have been discovered in the Tertiary area; in the Wind River basin a gas field was found beneath a Tertiary structure; and in the Green River basin, a very important gas-distillate pool has been discovered by geophysical methods. In other basins, there have been showings of oil and gas to encourage wildcatters. However, nothing of importance has developed in the shallower Tertiary rocks, and the new pools are in Cretaceous and Permian formations at depths of 8,000 to 12,000 ft.

Fig. 1 shows the large number of seismograph and gravity meter crews that were at work during the month of July. The small circles are seismograph parties, and there are 57 separate crews. The small triangles are gravity meter crews, 25 in number. Most of these are operating in the Tertiary basins although some are still searching for concealed structures in the intervening zones around the basins.

Cost of this geophysical work is very great. An average reflection seismic party in the Rocky Mountains costs about $15,000 per month, and for 57 parties, that totals about $855,000 per month. An average gravity meter party costs about $5,000 per month, including the office interpretation of the field data, and for 25 parties the total is about $125,000 per month. The grand total for 82 geophysical parties is about $980,000 per month, or $1,000,000 per month for exploration parties if a few core-drill and magnetometer crews are added.

*Manager, exploration department, Stanolind Oil & Gas Co., Tulsa. This article is a summary of a paper presented at the regional meeting of the A.I.M.E., Denver, September 28-October 2.

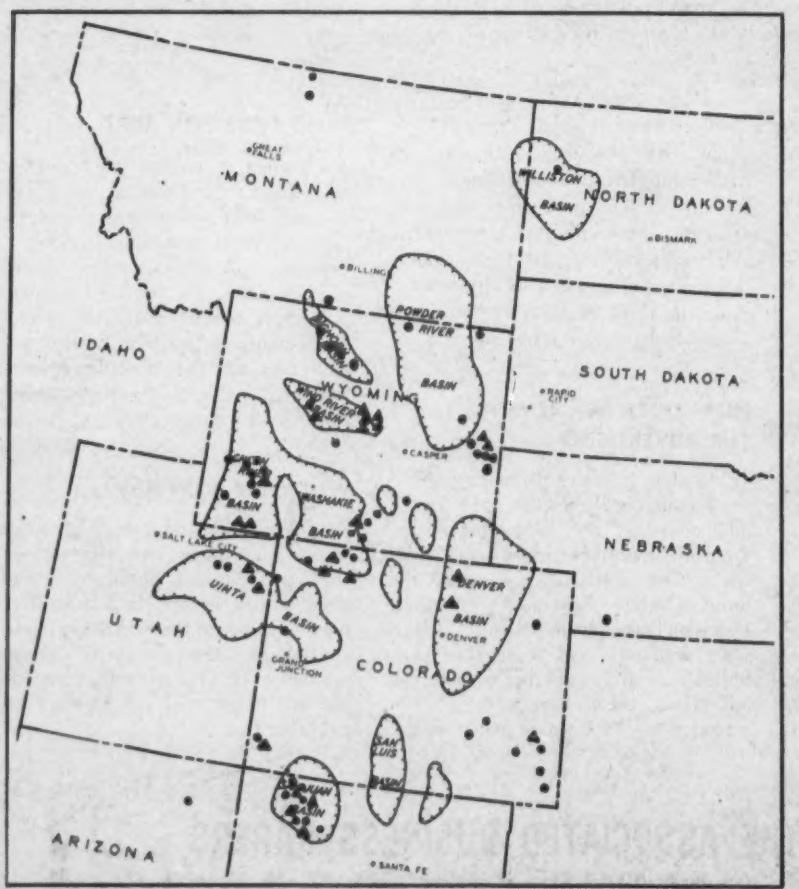


Fig. 1—Outline of early Tertiary basins of Rocky Mountain region. The black circles are locations of present seismograph exploration parties, the triangles are gravity-meter crews

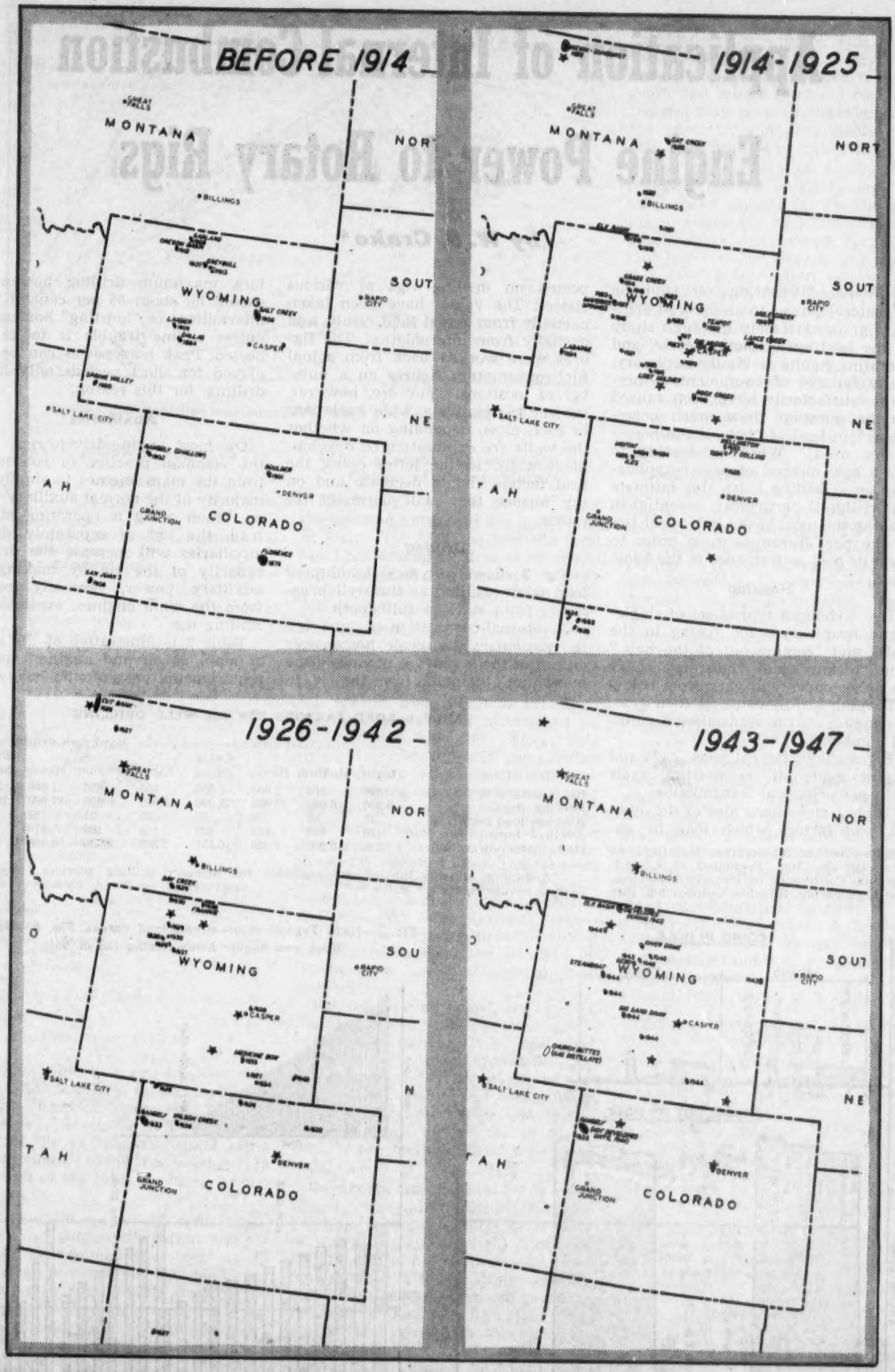


Fig. 2—Four time stages for principal oil discoveries in Rocky Mountains. Year of discovery is shown for each oil field. Stars are locations of refineries

Application of Internal-Combustion Engine Power to Rotary Rigs

*by W. S. Crake**

BEFORE purchasing or applying motive power to an oil-well drilling rig, an extremely thorough study of the load cycle, motion cycle, and operating habits is vitally necessary. Many failures of equipment to perform satisfactorily have been caused by the question "how much horsepower? instead of "how is the horsepower used?" When attempting to use a new method of power application on a drilling hoist, this intimate knowledge is particularly essential in making the most of the characteristics of the new transmission in order to yield its best performance at the hook.

Hoisting

Fig. 1 shows a typical set of single-stand load curves for "going in the hole" and "coming out of the hole." The "pickup" and "hoisting" peaks on either curve will vary from below full value to full value in each gear, depending on the transmission method employed.

Fig. 2 shows typical hook loads and engine loads on the hoisting cycle with a mechanical transmission.

Table 1 gives some idea of the overall load factors which may be expected on drilling rigs of various classes. The values have been taken partially from actual field results and partially from interpolation. The figures were worked back from actual fuel-consumption figures on a number of locations. They are, however, subject to relatively wide variations in each class, depending on whether the wells are exploration or development wells. In the latter cases, the load factors should decrease and on the former they will normally increase.

*Chief mechanical engineer, Houston area, Shell Oil Co., Inc. Presented at A.S.M.E. National Conference on Petroleum Mechanical Engineering, Houston, October 5-8, 1947.

Drilling

Fig. 3 shows a typical buildup of load while drilling as the well progresses from start to full depth.

On internal-combustion-engined rigs, in particular, the peak horsepower output of the engines is obviously the maximum obtainable from the rig. In fact, maximum drilling horsepower should be about 85 per cent of peak intermittent or "hoisting" horsepower unless engine trouble is to be expected. Peak horsepower can be employed for short periods only, when drilling, for this reason.

Auxiliaries

On most engine-driven rigs, it is the common practice to rob power from the main engines to supply the majority of the normal auxiliary power. When a rig is operating at full load, the use of separately driven auxiliaries will increase the drilling capacity of the rig by making the auxiliary power, normally robbed from the main engines, available for drilling use.

Table 2 is illustrative of the order of main power and auxiliary power requirements on an extra-heavy rig.

TABLE 1—LOAD FACTORS FOR OIL-WELL DRILLING

	Gulf Coast drilling				Hard rock drilling			
Class of rig—	Light	Medium	Heavy	Extra heavy	Light	Medium	Heavy	Extra heavy
Rig horsepower*	400	600	1,000	1,500	400	600	1,000	1,500
Drilling depth	5,000	8,000	10,000	12,000	6,000	9,000	11,000	15,000
Average load factor, %	45	43	33	28	35	31	27	23
Average horsepower load	180	258	330	420	140	186	270	345
Daily horsepower hours	4,320	6,200	7,920	10,200	3,360	4,430	6,480	8,300

*Assuming all this horsepower available for primary drilling services. Auxiliary service requirements are extra.

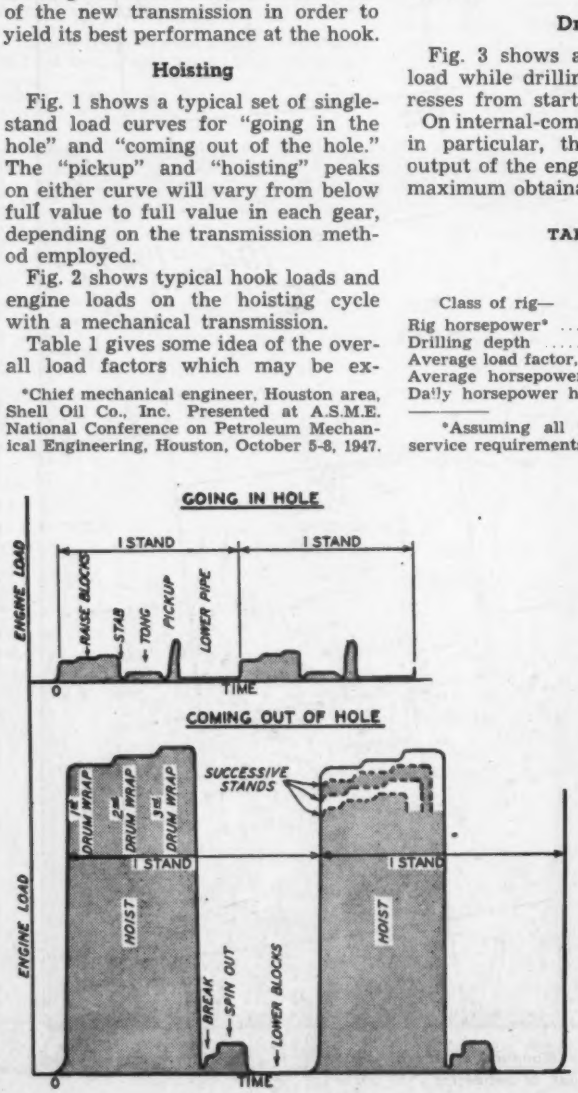
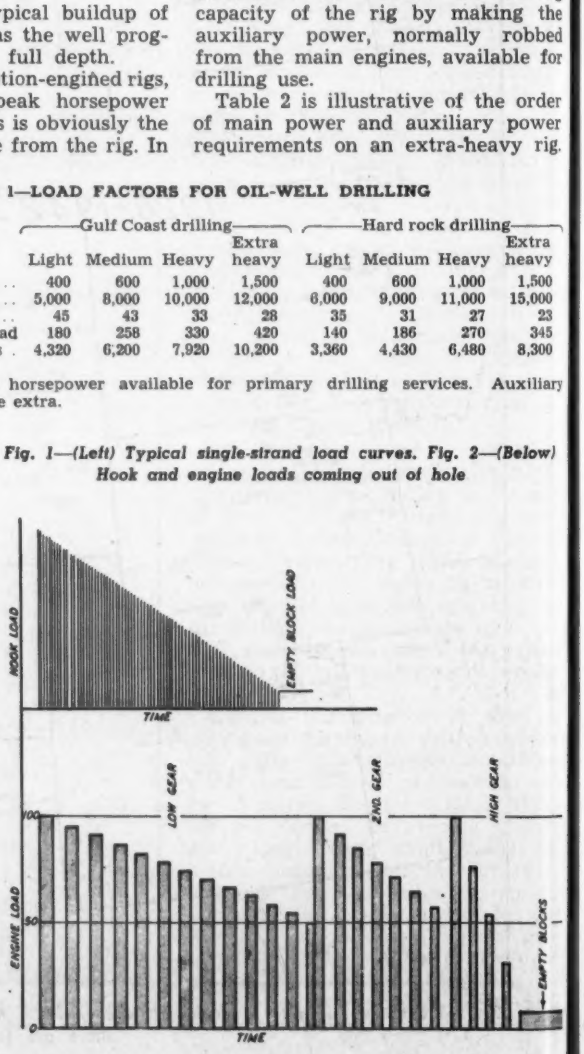


Fig. 1—(Left) Typical single-strand load curves. Fig. 2—(Below) Hook and engine loads coming out of hole



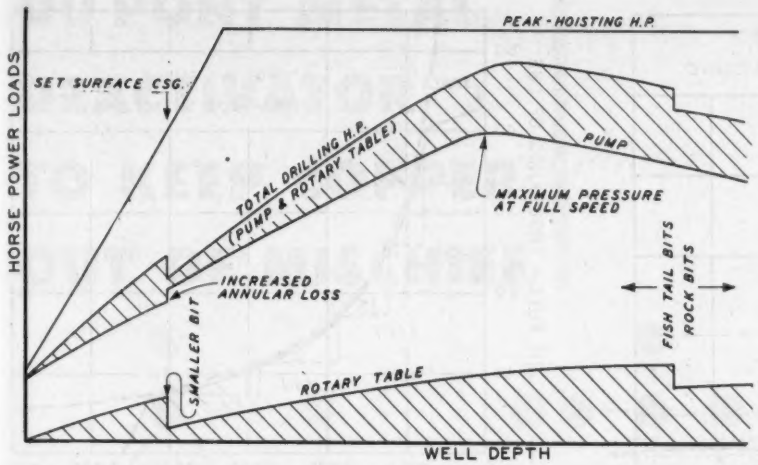


Fig. 3—Typical drilling-well horsepower loads (one size of drill pipe)

TABLE 2—POWER SERVICES

Drilling

Main:
- (a) Main slush pump
- (b) Rotary table
- (c) Auxiliary slush pump—alternate to (a) when needed
- (d) Mud mixing pump

Auxiliary:
- (a) Lights
- (b) Washdown pump
- (c) Mud screens
- (d) Bug-blower fans
- (e) Air supply
- (f) Blowout preventers

Hoisting

Main:
- (a) Hoist
- (b) Rotary—breakout

Auxiliary:
- (a) Lights
- (b) Washdown pump
- (c) Bug-blower fans
- (d) Air supply
- (e) Blowout preventers
- (f) Fillup pump

Approximate Auxiliary Horsepower Required

Service—	HP.
Lights, etc.	7½
Washdown pump	7½
Mud screens (2)	4
Bug blowers (2)	4
Air supply	5
Fillup pump, BOP pump	20
Total	48

Say, 60 hp. available

From Table 2 it can be seen that the total auxiliary power is in the neighborhood of 5 per cent. This excludes engine-cooling fans which are part of the engine and would bring the auxiliary power up to about 15 per cent of the total produced by the engines.

The auxiliaries would run, simultaneously, sufficiently often that it should be assumed that they would be using power from the main engines for a considerable part of the day's run. There is, thus, little out of the ordinary in auxiliary load characteristics, but they must be considered, and the most vital pieces of auxiliary equipment are usually supplied in duplicate.

Effect of Load Characteristics on Choice of Prime Movers

Flexibility.—As can be seen from the hoisting portion of the load curve in Fig. 1, the load requires the most rapid possible application of accelerating torque and a horsepower delivery which mounts as rapidly as the load reaches full speed.

Since no mechanical coupling methods, such as friction clutches, will stand the wear and tear of being thrown in against engines running at full speeds, some methods of reducing these shock loads is vital on all drilling machinery. On direct mechanical drives, the only compromise is to connect the load with the engines running at about idling speed and then accelerate the engines. This does not produce any torque multiplication, but is cable of being withstood by clutches. For this reason, drilling rigs generally require engines with rapid acceleration characteristics and relatively light flywheels—automotive-type performance—to obtain the desired acceleration and reduce maintenance costs on transmission members.

The use of slow-speed, heavy-duty engines has not, to the writer's knowledge, been successful in any field application for these reasons and the list of present-day hoists are no exception to this statement. When using diesel engines, with their known flat torque curves, the shocks to transmission are doubly difficult to withstand.

Governors and flywheels.—As mentioned above, all transmission methods require engines highly responsive of speed to load and light flywheels are, therefore, highly desirable. General practice is to use engine-throttle controls with a maximum governed speed of the engine. All drilling loads are of the type which make the increasing of torque by automatic opening of the throttle by governors highly undesirable. If the torque raises at any throttle set point, the speed should drop accordingly. This is particularly the case when rotary tables are driven through speed-reduction gears and where governor-controlled engines may open up, unbeknown to the operator, and very easily cause drill-pipe failures or twistoffs.

The single exception to the above points is the use of heavy-duty constant-speed engines for electric drilling in which the load is coupled and accelerated, not through friction clutches but by electric motors. In this case, power input can be controlled easily by the operator. In view of the undesirable nature of running any engines on a drilling rig at full speed continuously and the primary requirement of portability, the writer feels that, even in this application, the light, flexible engine is desirable, along with some device which idles the engine when it is not required for full-speed operation.

Load coupling.—The most modern hoists tend towards complete friction clutch drives, both for speed changes and main load coupling. The actual load-coupling unit varies with the various types of transmissions enumerated below. All types can best be operated by starting from near idling speed before coupling and by accelerating the load as the engine itself accelerates to the required power-output speed.

Characteristics of Transmissions

The following paragraphs are an attempt to give a direct comparison among the mechanical, electrical, and hydraulic methods of transmission, when properly applied to drilling hoists and other drilling machinery. The specific examples are chosen as being representative of each transmission method and will show the hoist-speed ratios and output torque-speed characteristics on each of the three methods of drive. A 1,000-hp. hook-load curve is shown, which is used as an example of a rig of about 1,500-hp. input.

In all the curves, a 1,000-hp. de-

TABLE 3—HOOK TO ENGINE SHAFT HORSEPOWER DATA

	Per cent
(a) Mechanical efficiencies:	
Hook to drum	92
Drum to average engine	75
Over-all	69
(b) Electrical efficiencies:	
Hook to drum	92
Drum to motor	90
Motor and cables	90
Generator	92
Over-all	68.5
(c) Hydraulic efficiencies:	
Hook to drum	92
Drum to average engine	75
Torque converter, average	81.5
Over-all	56.25

Horsepower Data

Method—	Engine shaft hp. for 1,000 hook hp.	Hook hp. for 1,450 engine shaft hp.
Mechanical	1,450	1,000
Electrical	1,460	996
Hydraulic	1,775	820

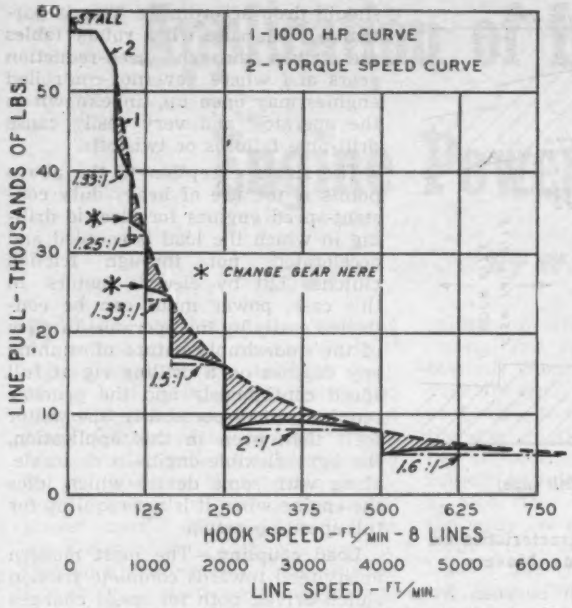


Fig. 4—Mechanical six-speed curves

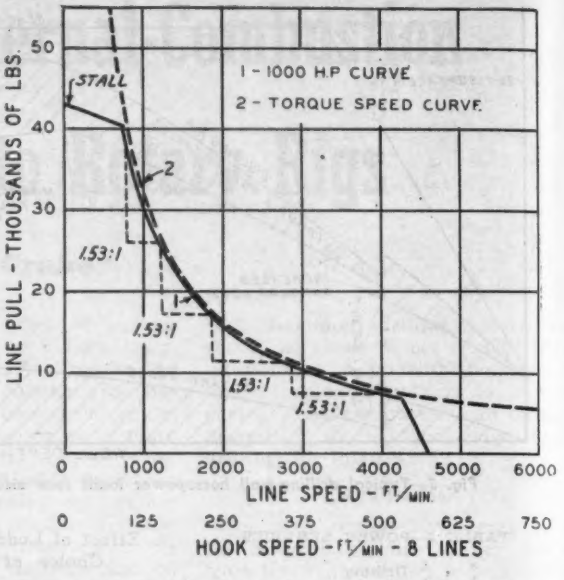


Fig. 5—Electrical four-speed curves

livered power is assumed, with some slight increase shown as the efficiency of the drive improves. As a matter of interest, and of considerable concern to users, the over-all efficiency of the three methods is given in Table 3.

Mechanical

As is well known, mechanical transmissions give output-torque characteristics which are, neglecting friction, in direct proportion to engine characteristics. Speed changes on decreasing loads are made after the engine reaches maximum governed speed and when engine loading has become reduced below the maximum by an amount inversely proportional to the next increase of speed ratio. When the speed ratio is decreased, the engine is once again loaded to full load at full speed and again falls off, step by step, as the load falls off. If, as is generally the case, the speed is changed too soon, the torque pulls the engine speed down towards peak torque speed of the engine, resulting in very slightly more torque but a greatly reduced speed. This gives a considerably reduced horsepower input to the machine. In either case, the engine reaches full horsepower at full speed at only one point of the load for each speed.

Fig. 4 illustrates the speed-torque characteristics of a mechanically driven drilling hoist which has, for the sake of illustration, a 1,000-hp. maximum hook horsepower. It will be noticed that, in order to reach the peak pulling torque and speed necessary for the class of hoist chosen, it is necessary to employ six speed steps.

The main load steps chosen are equal load steps with a special ratio step shown on each end to obtain the high peak speeds and torque necessary for full performance.

The shaded areas under the curve represent loss of applied horsepower to the load because of the necessity to reduce engine speed, or load, to conform to the gear ratios. A greater number of speeds, naturally, would reduce the area of the losses.

All mechanical hoists use friction clutches for coupling the engines to the load. In some cases, hydraulic couplings are also employed to absorb peak torque shock loads. Hydraulic clutches are seldom used for actually coupling the loads because of the extreme variations in speeds required from a drilling hoist and the low efficiency of hydraulic couplings at low speeds.

The best of modern hoists employ friction clutches to a large degree for speed changes as well as for load coupling. Accelerating of loads is almost invariably performed by coupling the loads at reduced engine speeds and accelerating engines and load together. Most hoist clutches will not withstand the overload caused by impressing engine full-speed inertias against the clutches.

As may be easily seen, the above statement is truer in the higher gears than in the lower gears because of the greater load inertia to be overcome in the higher speeds. For this reason, many "high" speed clutches give far more trouble and have higher maintenance costs than low-speed clutches.

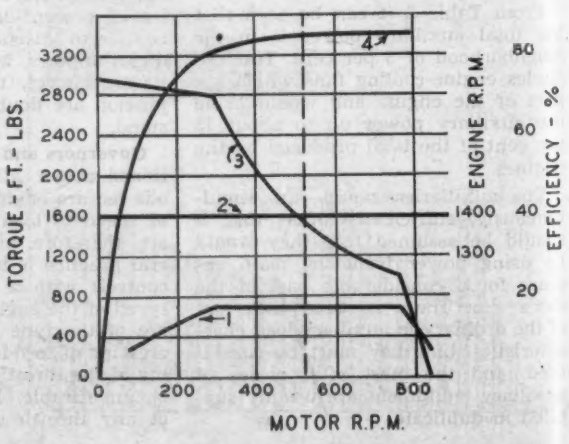


Fig. 6—Engine-electric motor characteristics: (1) engine torque; (2) engine speed; (3) motor torque - speed; (4) output efficiency

Electrical

In this discussion, no account will be taken of a.c. power for drilling rigs because of the relatively poor characteristics of a.c. for hoisting and the fact that central-station power is seldom available for drilling service. Generation of a.c. on the site in a rig power plant is impractical and undesirable unless under highly specialized circumstances. The discussion, therefore, concerns only d.c. power applications of the basic Ward Leonard type. This type of power has proved ideal throughout industry for all types of hoisting and transportation involving heavy accelerations, high peak loads of short duration, and variable speed loads.

Fig. 5 shows a speed-torque curve

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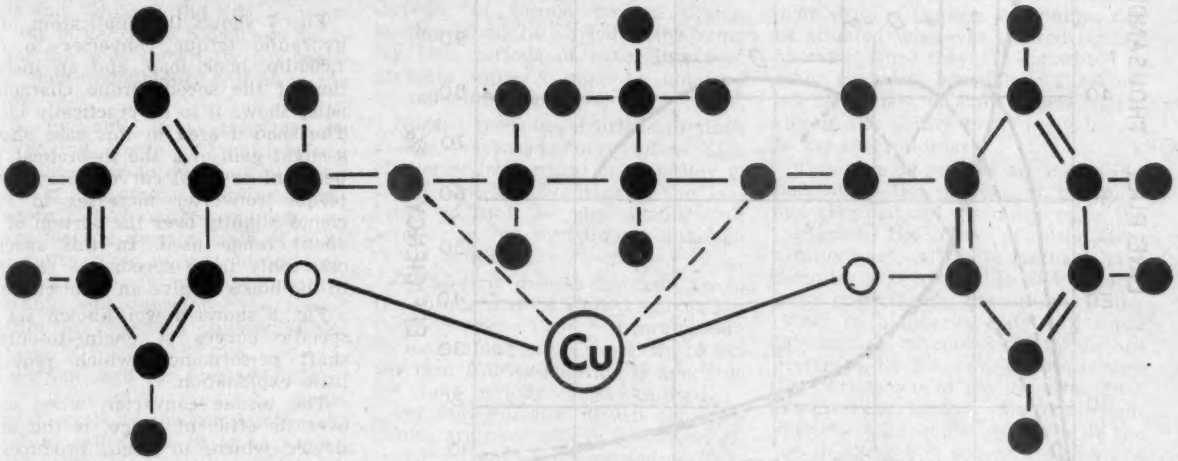

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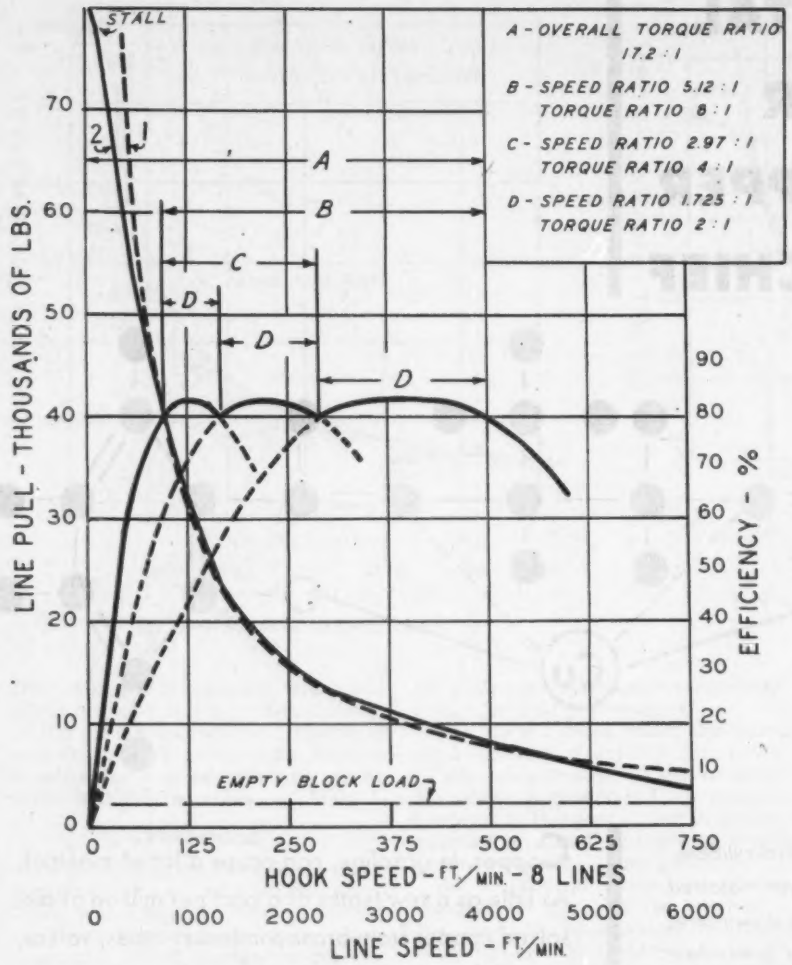

STALL
A - OVERALL TORQUE RATIO 17.2 : 1
B - SPEED RATIO 5.12 : 1 TORQUE RATIO 8 : 1
C - SPEED RATIO 2.97 : 1 TORQUE RATIO 4 : 1
D - SPEED RATIO 1.725 : 1 TORQUE RATIO 2 : 1
LINE PULL - THOUSANDS OF LBS.
EFFICIENCY - %
EMPTY BLOCK LOAD
HOOK SPEED - FT./MIN. - 8 LINES
LINE SPEED - FT./MIN.

Fig. 7—Hydraulic three-speed hoist: (1) 1,000-hp. proportional curve; (2) hoist-output curve; (3) efficiency curves of torque converter steps

of the 1,000-hp. exemplary hoist load, using d.c. motors. As can be noticed, the main speed steps are identical with the mechanical-hoist example in Fig. 4, but the low and high gears are omitted and unnecessary. This, therefore, calls for only four speeds instead of six to give the total load-speed range required.

It can be seen that the power produced by the motor drive is almost identical with a true mean horsepower curve. This is due to the fact that, being electrically coupled to the load, the engines can run at full speed and produce full horsepower for each step of the load, as long as the driving motors can withstand the torque (or current) demand of the load.

Figure 6 gives a composite set of engine to motor-shaft curves which are interesting when compared directly with those in Fig. 8, below.

The chief advantages of electric motor drive over direct mechanical drive are:

1. Starting torques up to 225 per cent (115 per cent for mechanical).

2. Electrical load couplings involves no slipping clutches or wearing out of mechanical parts—can stall at any load up to full load, indefinitely.

3. Engines can deliver full horsepower to motors at any speed at which latter can absorb it.

It should be remembered that, except for almost instantaneous peak torque available over the accelerating period, the electric motor itself does not incorporate speed ratio changes. It is essentially a high starting torque device, with full torque almost instantly obtainable at any speed up to full speed. By using oversize motors and generators, higher current capacities are usable at the same horsepower engine output, thus giving the effect of torque multiplication.

Hydraulic

Fig. 7 shows the application of a hydraulic torque converter to our 1,000-hp. hook load, and an inspection of the speed torque characteristics shows it to be practically ideal. The shaded area in this case shows a slight gain over the theoretical 100 per cent or ideal curve, because the torque converter increases in efficiency slightly over the portion of its speed range used. In this specific case, only three speeds are required in the hoists to give an ideal curve.

Fig. 8 shows a well-known set of specific curves of engine-to-output shaft performance, which requires little explanation.

The torque converter, when used over its efficient range, is the only device which, in itself, produces a speed-ratio change, allowing the engine to run at full horsepower at full speed and deliver full horsepower at a reduced speed to the delivery shaft. For this reason, it has the most ideal characteristics of all known methods for variable load hoisting operations.

The load accelerating characteristics are not as good as the d.c. electric, but the load coupling is almost identical and about as trouble free—no moving mechanical parts being in the friction circuit.

Effect of Hoist Design

As seen from a study of Figs. 4, 5, and 7, either a six, four, or three-

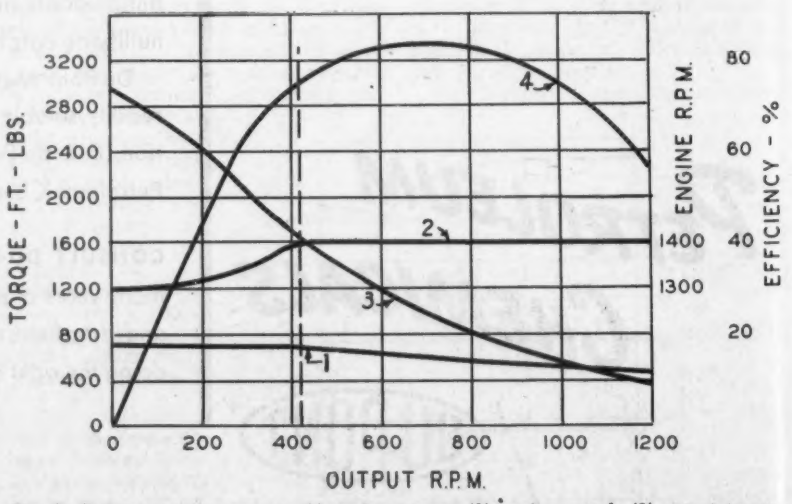


Fig. 8—Torque-converter curves: (1) engine torque; (2) engine speed; (3) output torque; (4) output efficiency

speed hoist is required for efficient usage. Any variations in these requirements would mean waste of expenditure for more than the requirements, or failure to perform adequately for less than the requirements. Even the distance between steps of speed changes is sufficiently different to make one machine be unsuitable to cover all three methods efficiently.

The hoist manufacturer must clearly build equipment which will be coupled to any of the three transmissions and, while at the time of writing, the large torque converters needed for the hoist shown are not available, they undoubtedly will be in the future.

The hydraulic drive, if placed on the engine shafts of multiengined rigs, places the torque multiplication ahead of the engine coupling transmissions, which correspondingly requires making them capable of up to five times their normal torque rating. This is clearly expensive and undesirable and, therefore, the torque multiplication device belongs in the hoist for greatest economy.

In effect, and for greatest adaptability of hoists to the three transmission methods, the compromise appears to call for a basic two-speed hoist using a two-speed auxiliary transmission for electrical or hydraulic drive, or a three-speed for mechanical drive. For somewhat deeper drilling, this might require a two-speed auxiliary for hydraulic drive, three-speed for electric and four-speed for mechanical. For shallower drilling, a single-speed basic hoist would suffice, with a two-speed hydraulic, three-speed electrical, and four or five-speed mechanical auxiliary transmission being used.

Rotary Drives

The mechanical gear change for rotary drives must be cautiously handled to avoid excessive torque loading of drill pipe and, in any case, should never be operated on the engine governor, since this device would merely open up as load increased and place full engine torque on the input end of the gear train, with unfortunate results to the drill pipe.

The same applies to the torque converter which can, at any point of engine throttle setting, multiply the set torque by about five, unknown to the operator, unless it is provided with automatic torque-limiting devices.

Electrically, the motor can simply be set to any desired stalling torque (or current), and provides the safest method of preventing excessive overload. This drive has infinitely variable speed from zero to full speed.

The torque converter provides the most ideal method of providing for emergency hoisting service in case of breakdown of the main equipment. In such cases, the efficiency of the drive is not nearly as important as a high range of operating torque, for which this device is best adapted. Normally, an emergency hoisting unit needs to be only 10-20 per cent of the main hoisting engine so as to get the operator out of major trouble in case of breakdown of the main unit.

Pump Drives

The slush pump is essentially designed as a constant-torque piece of equipment and torque multiplication is undesirable for pump drives. Any increase of torque beyond design loading cannot be carried by the pump for long periods of time. Increased pressure capacity must be obtained by reducing liner sizes.

Normal mechanical drives to slush pumps are satisfactory and of high efficiency from pump drive pulley to pump. One disadvantage is the inability to stall or slip against full torque as is sometimes, although rarely, required.

On electric drives, any load up to full torque may be stalled against the pump as desired and full torque may be maintained at all times. Up to 225 per cent full-load torque is available for short periods, when required.

On hydraulically driven rigs, the pumps are most efficiently driven direct from engine drives and, as previously stated, the torque converter best belongs on the hoist, where its characteristics are suitably employed. The only exception to this is, possibly, on workover rigs where temporary torque multiplications are very useful on occasions. In such cases however, automatic limitation of torque multiplication is advisable.

Hydraulic couplings between engines and pumps permit of full torque and 100 per cent slip of load when desired, similar to electric drives. Since slipping of pumps is rarely required, there is some doubt as to the economic value of hydraulic coupling pump drives. One pump on a rig, equipped with a slip drive, and of low volume, since no volume passes on a stall, should be sufficient for full slip loads.

If sufficient engine capacity is provided for driving pumps up to full torque and speed, the writer sees no economic justification for the use of torque multiplication for this service. It is quite certain that limited horsepower purchased cannot be substituted for by torque multiplication. If not carefully engineered and used with discretion, torque multiplication can definitely harm pumps.

Portability and Rigging Up

In selecting drilling equipment of the ultraheavy type, considerable thought must be given by the operator to the cost and complexities of foundations, erecting, and tearing down of the rig in service.

The straight mechanical rig of large size requires a solid foundation preferably of concrete, and large, expensive substructures to keep the engines and transmissions in proper alignment. Failure on this score will cause high chain, bearing, and shaft maintenance costs. The larger and more rigid these units become, the greater is the necessity of rigid foundations for reducing maintenance costs.

The hydraulic rig, which uses and same in-line rigging-up system as the mechanical, is subject to the same limitations as above. Electrically, the hoist and drive motors are close coupled on small foundations and the main driving engines and pumps can be situated wherever desired by the operator, since they are connected to other rig parts by cables. The electric rig equals, or even betters, steam rigs in the ability to fit a rig layout to the surroundings.

Tonnages on moving are not as important as the number of packages and simplicity of assembly, or as the maximum flexibility of installation arrangement. All these features have definite economic value and become more important as the equipment becomes of higher capacity. All these factors must be considered by the operator to fit his own circumstances. The writer would say that the first requirement is that the equipment shall have adequate ability to do the job in hand. The second requirement is low over-all operation cost. First cost is of secondary consideration because, on deep drilling operations, very large ton mileages are carried through the hoist and other rig members, all of which carry their definite "cost per—" operating penalty.

Field performance indicates that the lower efficiency of the hydraulic drive is largely returned in improved hoist performance, but that the electrical drive is more efficient and, with modern improvement, such as the electrohydraulic governor, should give somewhat lower engine operating costs and simpler remote-control apparatus.

It would seem, however, that "the race goes to the swift." Hydraulic converters are not yet available in the sizes necessary and the electrical industry is certainly not in pace with the oil industry in its ability to furnish standard assemblies of electrical equipment out of stock, or on rapid delivery, even in normal times. Most operators would expect to await delivery of special extras on rigs or for specially designed rigs, but on-the-shelf designs of either type must be available.

Finally, a heavy rig, involving from $350,000 up, should not be an overnight purchase, but should be thoroughly engineered from a long-life, low-maintenance-cost standpoint.

The author wishes to thank Shell Oil Co., Inc., for furnishing the operational data used in preparation of this paper and, also, The Oil and Gas Journal, General Electric Co., and Twin Disc Clutch Co., for assisting with the illustrations.

Drilling-Mud Problems of The Rocky Mountain Region

by D. D. Varnell and W. B. Kimbrell**

MUD problems in the Rocky Mountain region are varied and directly associated with the geological sections involved. The uppermost Jurassic and Cretaceous formations present loss of circulation problems, the Triassic and Permian formations contain anhydrite contamination, and the Pennsylvanian has low-permeability sands requiring protection.

Jurassic and Cretaceous Drill Fast

The Jurassic and Cretaceous formations are mostly sands and shales that drill at a fast rate and stand up very well with an average mud. There are no detrimental contaminants, and the shales furnish a normal amount of satisfactory base mud. The main mud problem results from a low formation pressure coupled with a fractured and highly permeable condition, which often results in severe lost-circulation trouble. The loss of circulation is not consistent and varies from slow leaks to cases where all circulation is lost, with the fluid level dropping several hundred feet down the hole.

Best proven procedure for combating severe losses embodies a few simple rules, and on most occasions their use has saved time and expense. While drilling zones where circulation losses might be expected, it pays to be on the alert and observe the loss as soon as possible. This will not only conserve mud, but it will prevent undue enlargement of the leaking channels.

A good practice has been to keep the pump suction with as little submergence as possible, so that air enters the pump as soon as any appreciable amount of mud is lost. It is important to use a bit with large water-course openings, so that high concentrations of lost-circulation material can be pumped in without danger of plugging. Carrying lost-circulation material in the mud and drilling the expected zones at a slow penetration rate often seals smaller leaks, as they are penetrated.

If complete circulation is lost, it is best to pull the drill pipe to a safe position and add a bentonitic material such as Aquagel to the surface mud until a high-viscosity and high-gel-strength mud is obtained. At the same time add about 12 lb. of bulk lost-circulation material per barrel of mud, and then lower the drill pipe to the position of the leak. The prepared mud is then spotted in the same manner as cement on a conventional plug-back job, and the drill pipe is again pulled into a safe position above the level of the high-viscosity mud. After the hole has set under static conditions for 4 to 6 hours, the drill pipe is lowered to bottom and the high-viscosity mud is circulated out at 200 to 300-ft. intervals and thinned back to normal.

Triassic and Permian Formations

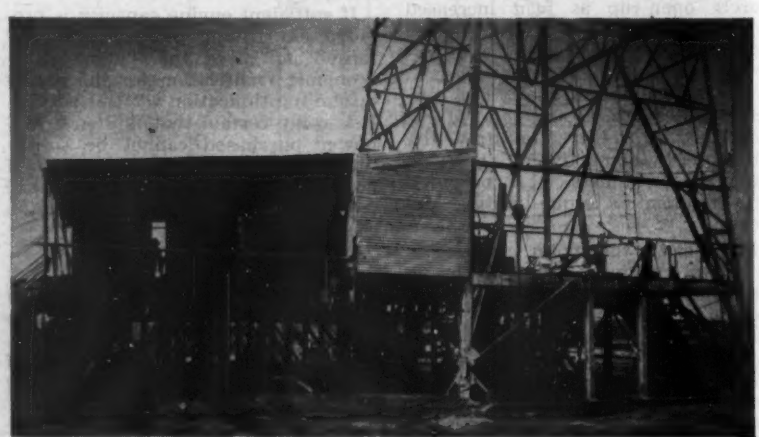
The Triassic and Permian formations are essentially sands and red shales containing interbedded anhydrite ($CaSO_4$) stringers. The anhydrite is relatively soluble and presents the major chemical treating problems in the Rocky Mountain region. The chemically active calcium sulfate has an extremely detrimental action on the mud, and its first effect is noted by a marked increase in viscosity and gel strength, which is followed by an excessive increase in filter loss. The immediate effects are twofold: first, the mud becomes highly resistant to flow, and the increased pump pressure either causes or renews lost-circulation trouble formerly corrected; second, high water loss and poor flow characteristics cause upper shales to start caving.

Most popular method of combating the soluble anhydrite has been to pretreat with a small amount of caustic and quebracho and then add a barium carbonate compound such as Anhydrox as needed to remove the calcium sulfate in the form of insoluble barium sulfate and insoluble calcium carbonate. This treatment is simple to use and consists of maintaining a pH of nine with caustic soda and quebracho, (avoiding a concentration of quebracho greater than 1 lb. per barrel of mud, as greater quantities may inhibit the barium carbonate compound reaction), and adding the barium carbonate compound as needed to offset increases in viscosity. This keeps the mud in a fluid condition and maintains the filter loss at the original amount.

Pennsylvanian Formations

The producing sands in the Pennsylvanian formations have varying permeabilities and contain fine shale particles intermixed with the sand grains. The permeability is greatly influenced by the concentration of the shale particles, and even in the better zones there appears to be a fairly large percentage of shale particles present. Past information indicates that these minute shale particles hydrate easily, and when in contact with fresh water, increase their effective size to temporarily, or possibly permanently, reduce the permeability of these sands to the flow of oil.

The most recent consideration of the problem involves controlling the hydration of these shale particles by varying the chemical composition of the liquid phase in a water base mud. It has been known from the beginning of mud studies, that various water soluble chemicals, when added to the liquid phase of the mud, will supress the hydration of clay. The most noticeable one is salt water, which suppresses hydration to a point where many high-yielding clays only give viscosity increases comparable to those obtained with nonhydrating particles.



Rig on one of the 72 locations in Rangely field

*Baroid Sales Division, National Lead Co. Summary of presentation at the regional meeting, Denver, of the Petroleum Division, American Institute of Mining and Metallurgical Engineers, September 28-October 2.

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Lead "soaps" form primarily in the dry paint film as it ages. This is where the "soap" formations impart their greatest benefits. When a paint film weathers and ages, decomposition products of the vehicle are formed. Red Lead's ability to slowly combine with these decomposition products actually enhances the life of the paint film. Red Lead's slow rate of reaction means the film age-hardens at a slower rate. It thus retains a high degree of flexibility, a great factor in its lasting adhesion.

The photomicrographs above show how Red Lead "soaps" progressively spread out as they grow and thus reinforce the paint film.

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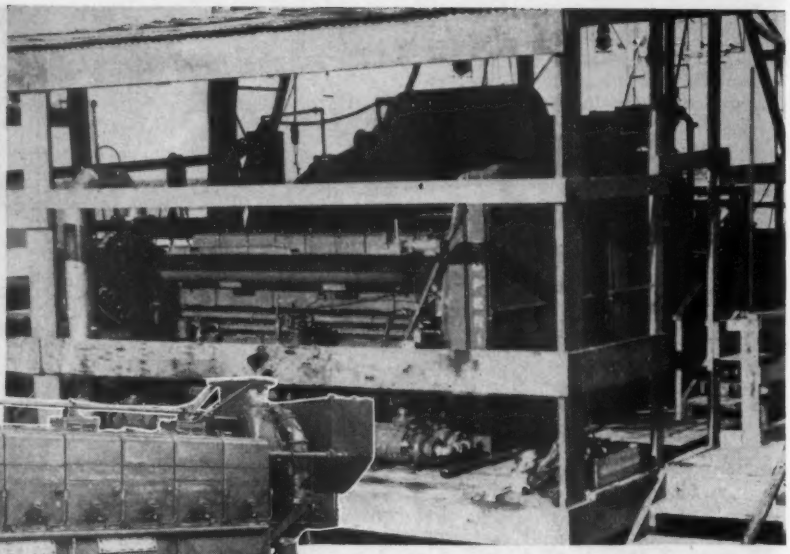
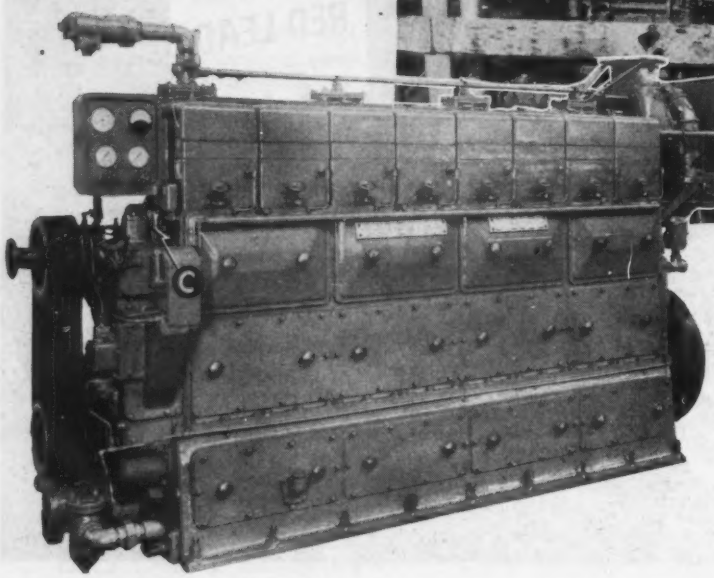
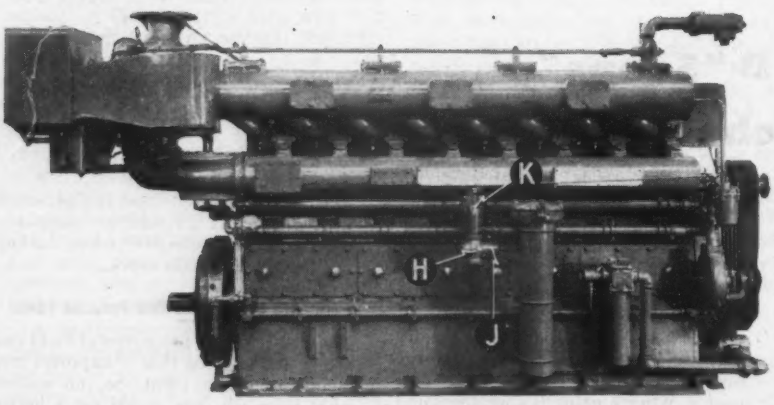
Fig. 1—(Right) Dual-fuel supercharged engine tested on a rotary-rig drive in California

Figs. 2 and 3—(Below) Control and manifold sides of PTDS engine without radiator, showing lever (C) for converting engine from fuel oil to dual fuel, gas-admission valve (H), its actuating hydraulic cylinder (J), and butterfly valve (K) for speed and load control







New Diesel Drilling-Engine Developments Field Tested

by G. F. Noltein*

BOTH turbosupercharging and dual-fuel operation now have been applied successfully to diesel engines for mechanical drilling rig drives. These two independent features further widen the field of application of the increasingly popular diesel drilling engine.

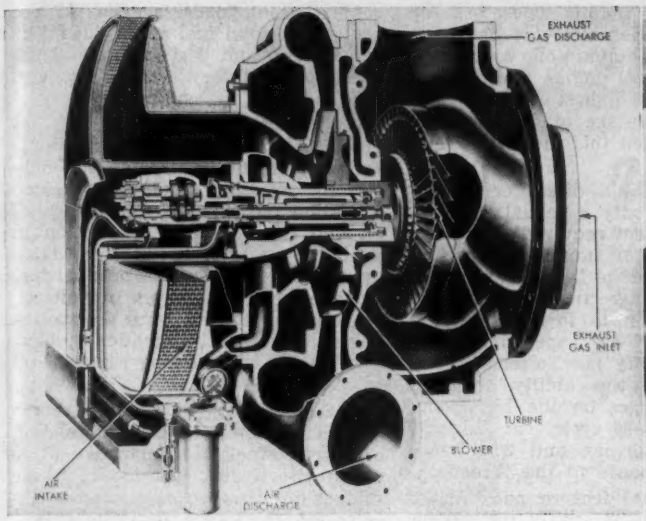
Supercharging greatly increases the power output of the engine with little increase in weight. Dual-fuel equipment permits conversion from oil to gas operation by the movement of a single lever while the engine is running—and the gas is burned more efficiently than in the conventional spark-ignition low-compression gas engine.

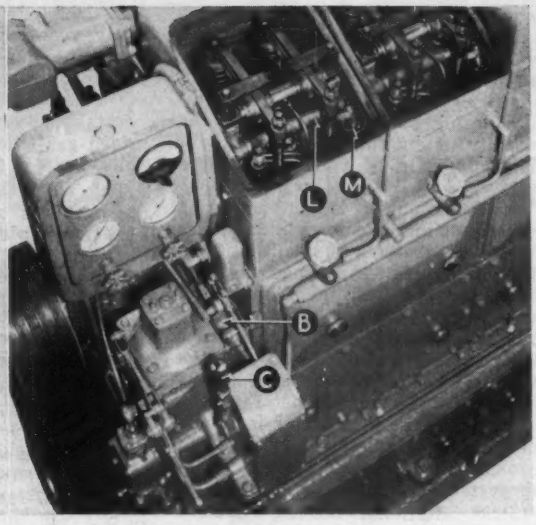
Successful Field Tests

Recent field tests have demonstrated fully the practicability of both supercharging and dual-fuel operation under severe drilling conditions. Fig. 1 illustrates a California rig using a supercharged dual-fuel engine paralleled with a similar naturally-aspirated engine. Both of these are Superior type PTD eight-cylinder engines with 8½-in. bore and 10½-in. stroke. The two engines are rated at 575 and 355 hp., respectively, at the conservative speed of 800 r.p.m., the supercharged engine developing about 60 per cent additional power. These engines, mechanically connected to a National Type 125 rig, performed under a wide range of operating conditions.

Although gas operation was not required by the operator on this hole, dry residue gas of about 1,050 B.t.u. was supplied for test purposes. One of the principal objectives of this field test was to demonstrate the flexibility and fast getaway of the dual-feed supercharged engine under actual drilling conditions. Continuous load-carrying capacity and fuel econ-

*Chief engineer, Superior Engine Division of The National Supply Co.





omy had already been established in other applications. The conventional diesel engine has the advantage of faster acceleration than the spark-ignited gas engine although this latter engine is regarded as highly satisfactory for drilling power.

With the diesel, the response of the fuel system to a throttle advance is almost instantaneous, the increased quantity of fuel oil entering the cylinder practically the next revolution. In the spark-ignited gas engine a small interval of time elapses after the throttle advance while a new set of conditions is being established in the intake system.

The supercharged test engine, operating on fuel oil or on dual fuel, gave very satisfactory rig performance, responding snappily to the driller's manipulation of the throttle and rapidly accelerating either the drill pipe or the empty blocks. The turbosupercharger introduced no element of lag in the rig performance.

This test also confirmed the anticipated fuel economies of the new engine which are shown graphically in Fig. 7. In addition to this California test of the supercharged dual-fuel engine, a number of Superior naturally aspirated engines fitted for dual-fuel operation have been operated in Texas and in Wyoming. In the following paragraphs will be found a brief technical description of these two features.

Turbosupercharging

Reduction in weight is always an advantage, but it is a most important consideration in connection with the trend towards the large drilling rigs being planned for increasing depths of new drilling programs. Supercharging increases the power output of the engine about 60 per cent with an increase in weight of only about 15 per cent. The weight per horsepower is reduced about 40 per cent.

Supercharging increases the combustion capacity of the cylinder in two ways. First, at the end of the

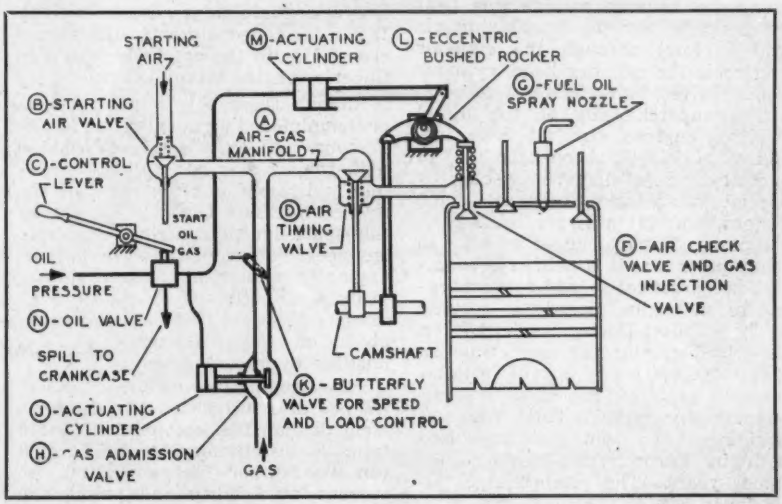
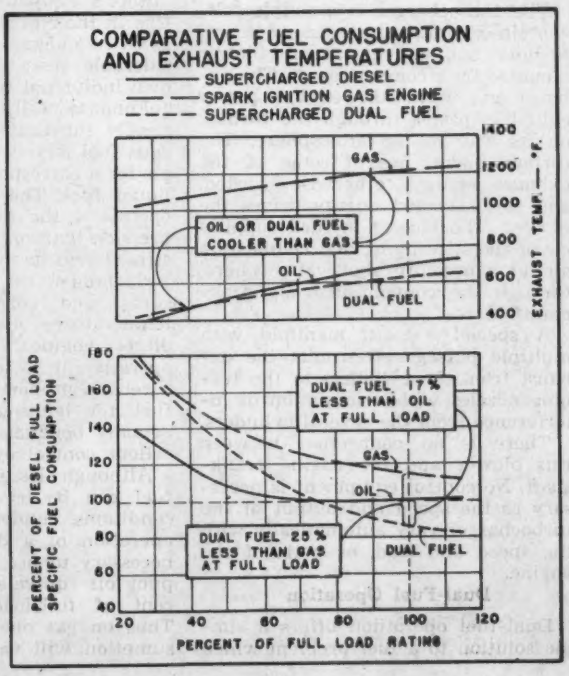


Fig. 4—(Top of page, left) Cutaway view of Elliott-Buchi turbocharger used for supercharging the PTDS engine

Fig. 5—(Top of page, right) Controls and Rocker assemblies of the PTDS dual-fuel supercharged engine, showing starting air valve (B), control lever (C), eccentric bushed rocker (L), and its actuating hydraulic cylinder (M)

Fig. 6—(Above) Dual-fuel system (schematic) supercharged diesel. Heavy lines show added dual-fuel parts

Fig. 7—(Right) Comparative fuel consumption and exhaust temperatures



exhaust stroke the blower scavenges the hot residual gas otherwise left in the cylinder and replaces it with undiluted cool fresh air; second, it fills the cylinder with air under supercharging pressure. This increased quantity of air furnishes oxygen for the combustion of a greater amount of fuel.

Increased power is obtained with only slight increase in cylinder pressure, the extra energy resulting from maintaining higher average pressure during the power stroke. This higher average pressure is possible in the supercharged engine cylinder because the additional fuel is burned with the same relative effectiveness as in the naturally aspirated engine. Furthermore, this additional power is developed with negligible increase in crankshaft and connecting rod bearing pressures.

Little additional cooling capacity is needed because considerable heat is dissipated by the scavenging air which blows through the cylinder and cools the cylinder head, cylinder walls, valves, and piston.

The supercharging of the diesel drilling engines covered here requires: (1) a turbocharger, (2) a special divided exhaust manifold, (3) special valve timing, (4) oil-cooled pistons, and (5) a larger lubricating oil pump. These changes involve so many parts that it is neither economical nor practical to add supercharging to an engine already in service.

The Elliott-Buchi turbocharger, used by Superior for some time on many stationary and marine installations, is used on this new drilling-engine application. This type of equipment has been built and used both in Europe and America for some years. The turbocharger is shown in Fig. 4.

The turbocharger is a simple self-contained unit, composed of a gas turbine and a centrifugal blower mounted on a common shaft. The exhaust gas from the engine power cylinders passes through the turbine on its way to the atmosphere. The turbine makes use of some of the exhaust energy, otherwise wasted, and this salvaged energy drives the blower. The blower in turn supplies all of the scavenging and combustion air, at a pressure above atmosphere, through the conventional air-intake manifold.

A special exhaust manifold with multiple passages transmits the exhaust from the cylinders to the turbine nozzles with a minimum of interference from the several cylinders.

There is no connection between this blower and the engine crankshaft. No control equipment is necessary as the speed and output of the turbocharger vary automatically with the speed and load, or both, of the engine.

Dual-Fuel Operation

Dual-fuel operatiion offers a simple solution to a fuel problem which has troubled drilling operators for many years. Heretofore it has been impossible to obtain in one convenient package a diesel engine which could burn fuel oil at highest efficiency and yet take advantage of free or low-priced gas when this fuel was available.

The convertible diesel engine of the past was only a partial solution. This power plant required considerable inventory of standby conversion equipment and a large amount of labor to change the engine from diesel operation to low-compression spark-ignition gas operation. The dual-fuel engine now offers in one compact unit the ability to burn either oil or gas on the high-compression diesel cycle, at highest thermal efficiencies, and with most favorable response to the throttle.

The dual-fuel feature adds about 10 per cent to the cost of the engine and a negligible increase in weight. It can be added either to the supercharged or to the naturally aspirated Superior engine at any time.

Rudolf Diesel's original patents contemplated the burning of liquid, gaseous, and even solid fuels on a high-compression cycle which is fundamentally more efficient than the low-compression Otto cycle used by the spark-ignition engine. European engineers developed the dual-fuel engine to a commercial point several years ago, motivated by the growing scarcity of liquid fuels and the availability of variable quantities of combustible byproduct gases.

The changing fuel picture in America has also influenced the development of dual-fuel engines for certain types of installations—engines which can use either fuel depending on current availability and price. The author's company, seeing a field for this in their drilling engines, as well as in commercial work, devoted considerable research to developing its own individual fuel systems.

Fundamentally the dual-fuel engine simply substitutes a portion of gaseous fuel mixed with the combustion air for a corresponding portion of the liquid fuel. The engine continues to operate on the diesel cycle with compression ignition. It has been demonstrated that gas will not ignite regularly under the compression pressures and corresponding ignition temperatures used in conventional diesel engines. Therefore, in gas operation it is necessary to provide a certain proportion of oil as a pilot fuel for igniting the gas. This is actually beneficial as it provides excellent control over gas operation.

Although lesser amounts of pilot fuel can be used under laboratory conditions, under the intermittent operation of a drilling engine it is necessary to use a fixed quantity of pilot oil equivalent to 10 to 15 per cent of full-load oil consumption. Thus on gas operation the gas consumption will vary from a few per cent at idling loads to about 87 per cent of the total fuel at full load. The actual ratio and the economy of gas operation will vary accordingly with the loading of the engine.

On the variable-speed drilling engine it has been found both simple and convenient to provide for only two fuel conditions: (1) full fuel-oil operation and (2) dual fuel with pilot oil and maximum gas. Variation in available gas can be accommodated by running some engines on dual fuel and the remainder on oil. In contrast, on stationary installations a more involved governor automatically handles a wide and varying range of oil to gas ratios.

The supercharged engine presents a special problem in the introduction of gaseous fuel. It cannot be introduced directly into the intake manifold as in the case of the naturally aspirated engine because the supercharged engine blows a portion of this air through the cylinder at the end of the exhaust stroke for scavenging purposes and this would carry with it some of the premixed fuel.

In the supercharged engine the gas must be injected into the cylinder under pressure after the scavenging is completed and the exhaust valve has closed. The supercharged engine described has a novel gas-injection system using the starting air-check valve already in the cylinder for the injection of gaseous fuel thus giving interchangeability of heads between diesel and dual-fuel engines.

This system is shown diagrammatically in Figs. 2, 3, 5, and 6. Note that either starting air or fuel gas can be admitted selectively to the air-gas manifold.

When the control lever (C) (Fig. 6) is moved in the starting direction, starting air pressure is admitted to this manifold. During this operation gas valve (H) is closed, the hydraulic actuated eccentric bushing (L) has made the cam control of air check valve (F) inoperative allowing it to act simply as a spring loaded check valve and the high air pressure had forced the timing vale (D) down against the cam shaft to time the admission of starting air to the cylinder.

After the engine is started, the control lever is moved to an intermediate position where there is neither starting air or gas in the manifold and the engine operates on oil.

If it is desired to operate on dual-fuel, the control lever is moved farther, opening the oil valve (N) which actuates the hydraulic cylinders on the gas-admission valve (H) and the eccentric bushing (L). Gas is now admitted to the starting air manifold where it is controlled by the butterfly (K) and the injection valve (F). The air-timing valve remains open because the gas pressure is not sufficient to force it down on the cam against the action of its spring.

(Continued on page 202)

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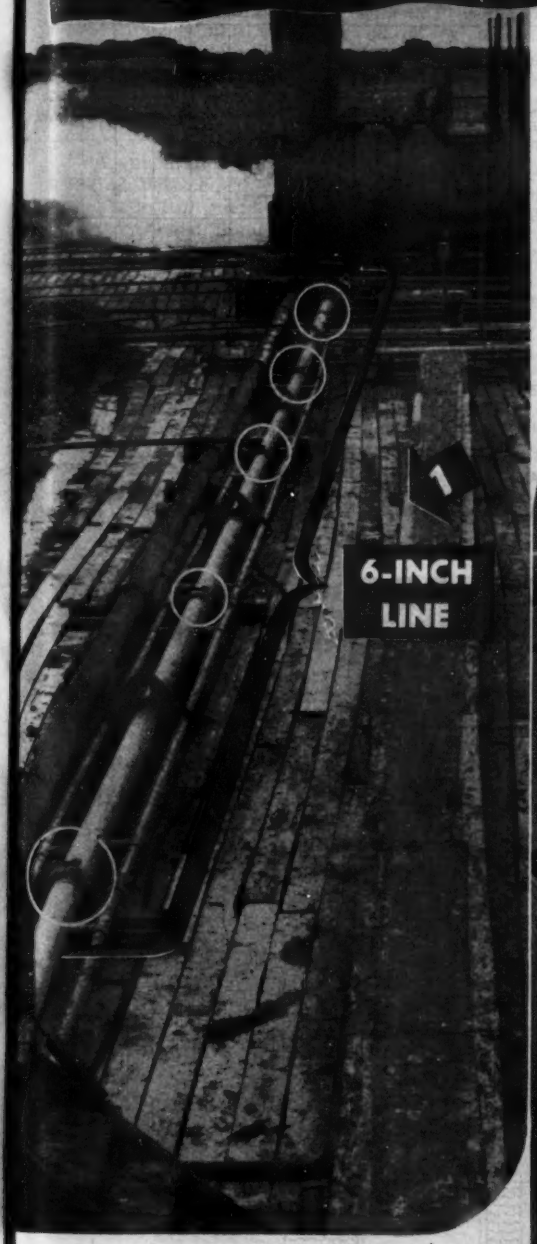

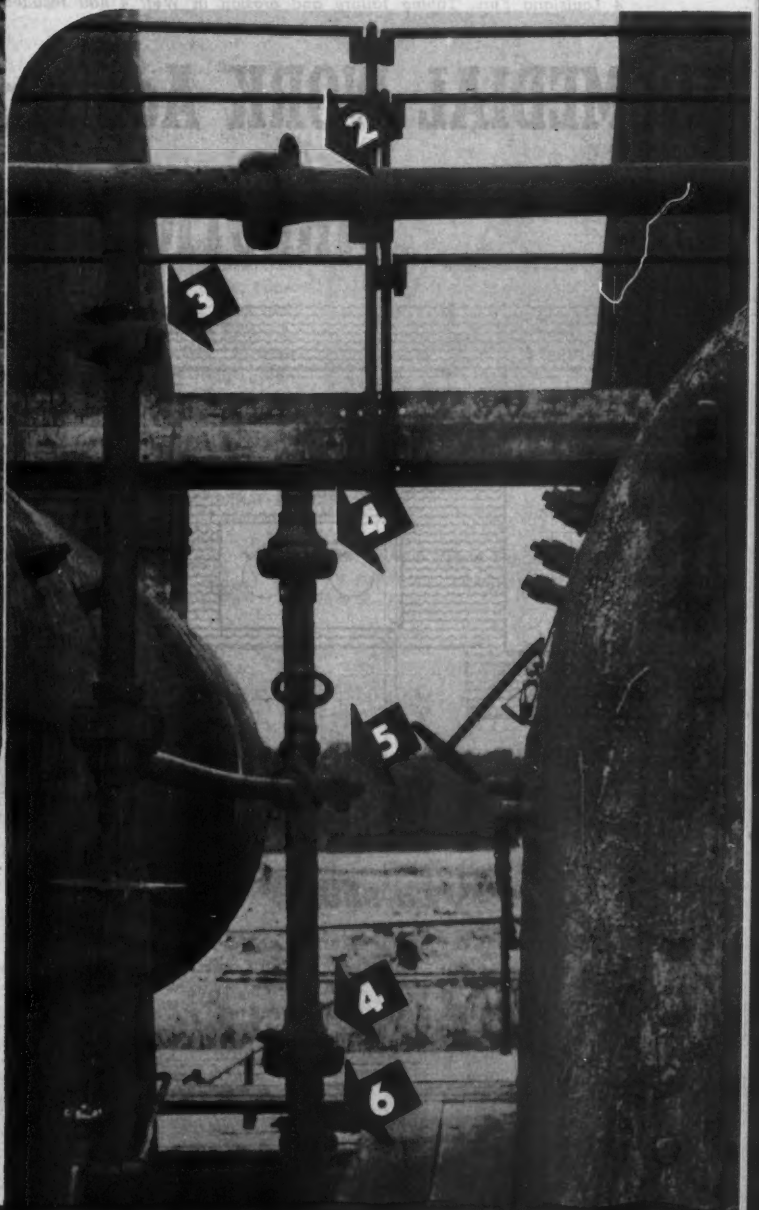

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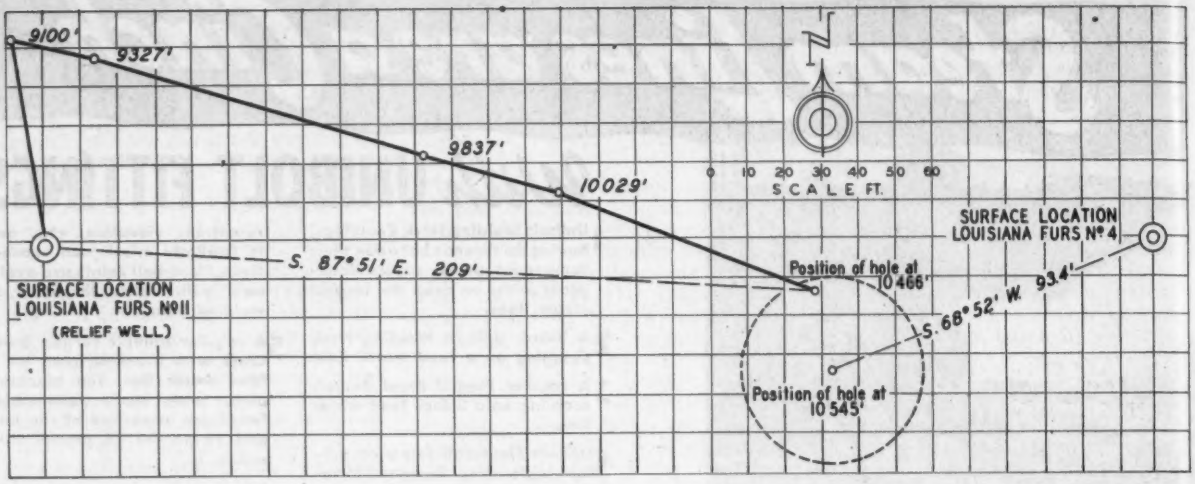
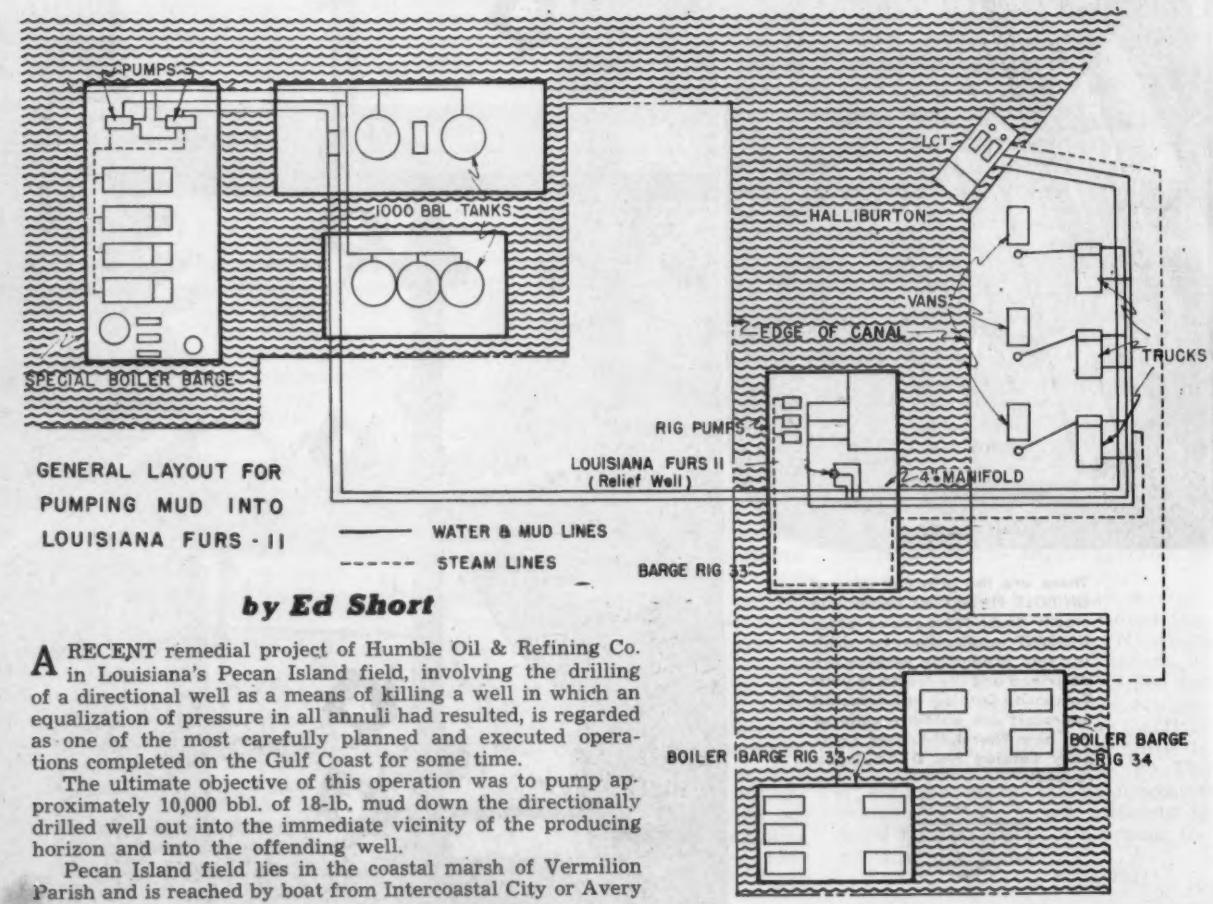


Position plat of Humble Oil & Refining Co.'s directionally drilled relief well, 11 Louisiana Furs, through which mud was pumped to kill 4 Louisiana Furs. Tubing failure and erosion in Well 4 had resulted in an equalization of pressures in all annuli

REMEDIAL WORK Accomplished by DIRECTIONALLY DRILLED WELL



GENERAL LAYOUT FOR PUMPING MUD INTO LOUISIANA FURS - 11

by Ed Short

A RECENT remedial project of Humble Oil & Refining Co. in Louisiana's Pecan Island field, involving the drilling of a directional well as a means of killing a well in which an equalization of pressure in all annuli had resulted, is regarded as one of the most carefully planned and executed operations completed on the Gulf Coast for some time.

The ultimate objective of this operation was to pump approximately 10,000 bbl. of 18-lb. mud down the directionally drilled well out into the immediate vicinity of the producing horizon and into the offending well.

Pecan Island field lies in the coastal marsh of Vermilion Parish and is reached by boat from Intercoastal City or Avery

Island. The field was discovered by Humble in February 1943, and since this time five gas wells have been completed at depths a little below 10,000 ft., and one well was completed in a gas zone at 7,400 ft. The tubing-head well pressure of these wells is between 3,000 and 4,000 psi. These wells are completed in the conventional manner, each being equipped with 2½-in. tubing and a packer.

The Offending Well

The appearance of pressure in the annulus between the 2½-in. tubing and 5½-in. oil string in 4 Louisiana Furs was the first indication of some type of a failure with the well. Tubing-head pressure on this well normally amounted to approximately 4,000 psi. Shortly after the appearance of pressure between the tubing and oil string, it invaded the annulus between the oil string and 10¾-in. surface pipe.

Failure of the tubing and subsequent erosion of the casing was suspected, and tools were immediately rigged up on 4 Louisiana Furs. Tubing was pulled under pressure and a hole where the hole in the tubing occurred.

An attempt was then made to mill out the bridge with 2½-in. tubing mill, but this was unsuccessful. From information gained during this work on the well it appeared quite likely that gas might be going out into the formation at 5,493 ft., the point at which the tubing was found parted in a collar. It was also concluded that there was a probable leak in the 5½-in. casing hanger, since there was a formation of ice on the bradenhead, indicating that gas was going from the 5½ to the 10¾-in. This was the condition of the offending well when it was decided to drill a directional relief well.

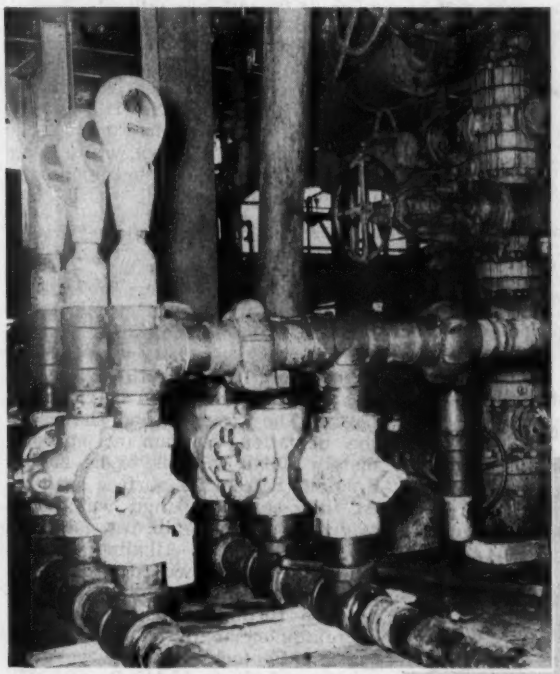
The efficient planning by Humble was evidenced in the successful killing of 4 Louisiana Furs without unnecessary delays and difficulties. The preliminary plan, drawn up with regard to both the drilling of the directional well and the layout of auxiliary surface equipment to be used in the killing operation were closely followed during the entire project. The accurate anticipation of possible slipup which might easily occur in work of this nature were indicated by the ultimate success of the actual killing operations.

Location of Relief Well

The location of a relief well, 11 Louisiana Furs, was spotted at an approximate distance of 300 ft. from 4 Louisiana Furs, the offending well. The bottom-hole objective was a point with approximately 25 ft. of the producing horizon in 4 Louisiana Furs. A standard Humble extra-heavy steam barge rig, equipped with five 130-hp. 300-lb. w.p. boilers, was used for this work.

Surface Layout

During the drilling of the relief well, work on the surface layout of equipment was begun. A diagram-



Left: Cellar hookup into 11 Louisiana Furs for pumping mud or water down casing or tubing or both. Four-inch lines on floor are from station No. 2. Lines come in from other side from station No. 1

View of 4 Louisiana Furs. Relief well tapped the producing formation at the bottom of this well

Below: View of self-propelled cementing barge and station No. 1. Cementing barge was later moved to station No. 2

was found in it at 1,650 ft. It was then found that the tubing was parted at 5,493 ft. An attempt was made to pack off between the section of tubing left in the hole and the section run back in. Cement was then pumped through the tubing to squeeze all the bottom of the well. However, the tool gave way and the cement was pushed up into the 5½-in. casing. Conditions indicated the possibility of a hole in the 5-in., possibly eroded through at the same depth

matic sketch of the entire plan is shown.

On a project of this kind, located in the marsh wasteland at some distance from the nearest town, the comfort of the large personnel required on the job at all times is obviously of prime consideration with Humble. One of the first steps toward the elaborate setup was the spotting of six large comfortable quarter boats, equipped with attic fans and inner-spring-mattress beds, on the canal near the scene of operation. The food prepared by Humble cooks surpasses that served at the finest of hotels.

Other preparations for pumping into 11 Louisiana Furs included the spotting and sinking of an auxiliary boiler barge, consisting of four 130-hp. boilers and two mud pumps, at station No. 1 as shown on the layout diagram. Also at this station, two auxiliary mud barges equipped with five 1,000-bbl. steel tanks and a circulating mud pump, were sunk. As the directional well neared the total depth, 12-lb. mud was mixed and pumped into the storage tanks and kept in slow circulation to prevent settling. During the installation of surface equipment an additional water well was drilled to serve the auxiliary boiler barge and quarter boats.

As shown on the layout plan, a 50-by-200-ft. mat was built on the spoil bank opposite the drilling rig and designated as station No. 2. A second boiler barge, consisting of four 150-hp. 350-lb. w.p. boilers was sunk in the slip at 11 Louisiana Furs. Additional lines were laid from the gas-dehydration plant on the lease, to supply gas to this boiler barge.

Referring to the layout diagram it will be noted that three Halliburton steam trucks, three feeder vans, and three bazookas with cutting tables were spotted beside the well. Steam for two of the Halliburton trucks was to be furnished from the boiler barge sunk in the slip, and the other unit was connected up to receive steam from the drilling-rig boiler barge.

In addition to the 12-lb. mud carried in readiness on the mud barge at station No. 1, 600 bbl. of 18-lb.-per-gal. mud was mixed and placed in the rig reserve tanks.

One of the new Halliburton self-propelled cementing barges was spotted beside the platform at station No. 2 and it was connected up to mix mud to be pumped into the well to augment mud mixed by the three trucks. The manifold hookup was such that mud could also be fed to station No. 2 as required from station No. 1. This station (No. 1) was connected to 11 Louisiana Furs by two 4½-in. lines (drill pipe) which were thoroughly pressure tested upon completion of the hookup.

Drilling of 11 Louisiana Furs

In drilling the relief well, a 12¼-in. hole was carried down to 7,973 ft., and at this point an electric log was run. Upon the resumption of drilling at this depth, the hole was reduced to 9⅞ in. When a depth of 9,103 ft. was reached, directional drilling was begun. The objective, as shown on the deviation diagram at approximately 10,440 ft., was to be 200 ft. S 80° 45′ E from the surface location. At this depth the mud was maintained at 10 to 10½ lb. per gal., with 3-4 cc. filtration. Alkaline tannate mud was used down to a depth of 8,064 ft. Below this depth starch was used to further reduce filtration.

Preliminary to the setting of 7-in. casing a Photoclinometer survey was run from 7,973 to 10,440 ft. with 100 stations. The 7-in. casing, which had been examined by both visual and electrolytic methods of inspection, was set at 10,466 ft., and cemented with 700 sacks of Unaflo cement. Approximately 10 lb. of Carnotite (a radioactive material) were mixed with the first 100 sacks of cement, and later the top of the cement was checked by both the gamma ray and temperature bomb methods.

Completion of 11 Louisiana Furs

In completing the well casing-head equipment was installed which con-

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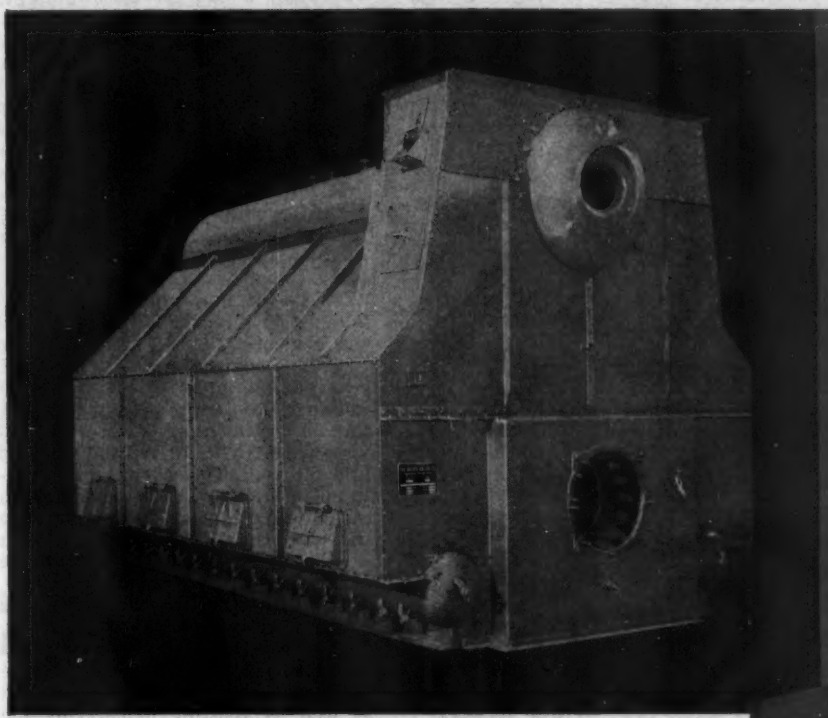

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sisted of a 10-in. spool with two 4-in. flanged side outlets, tubing head, 7-in. master valve and two 7-in. Q.R.C. blowout preventers.

A string of 3½-in. drill pipe was picked up to drill the cement in the 7-in. casing, and below the pipe a 6-in. hole was carried on down to a total depth of 10,592 ft. The sand was topped at 10,551 ft.

Killing Operation

Upon reaching the total depth, a string of 2½-in. tubing was run. The hole at this time contained 10.2-lb.-per-gal. mud. The first attempt was then made to break the formation with mud. A pressure of 2,500 psi. was applied but it failed to break. The tubing was then pulled and rerun with a retrievable retainer on bottom. Pressure was again applied and the formation broke down with mud at a pressure of 4,200 psi. It finally broke to a minimum of 2,400 psi. and took 53 bbl. of mud and 572 bbl. of water.

It was decided that a shale break encountered above the top of the sand had sloughed and that the shale in the bottom of the hole restricted the pumping of mud into the formation. A 5-in. o.d. liner was then set from 10,592 to 10,341 ft. and perforated with 481 shots from 10,550 to 10,592 ft.

After the liner had been perforated, a retrievable cementing packer was run on 2½-in. tubing to 10,313 ft. Blowout preventers were removed, a christmas tree installed, and the mud in the well displaced with water. The packer was then set and water pumped into the formation through the tubing for 8 hours. The three cementing trucks were used for this operation; to pump at a maximum rate of 374 bbl. per hour at 4,000 lb. pressure.

The cementing packer was unseated at this point to allow water to be pumped into the tubing and casing simultaneously. The Halliburton pumps, rig pumps, and the two pumps at station No. 1 were used as needed to obtain a rate of 1,000 bbl. per hour. Pressure gradually decreased to 1,900 lb., where it remained constant as pumping was continued. A total of 123,121 bbl. of water was pumped into the well in 138 hours. Sodium thiosulfate was added to the water as a tracer in the event that returns were obtained in 4 Louisiana Furs.

It now appeared that no further benefit would be obtained by continued pumping of water, and the mixing and pumping of the 18-lb.-per-gal. mud was begun.

Twelve-pound-per-gallon mud was pumped to the cementing trucks and the cementing barge from the five 1,000-bbl. storage tanks with the slush pumps at station No. 1. With weighting material fed to the hoppers by the bulk cementing vans, the mud was weighted to 18 lb. and pumped into the well. To feed weighting material to the vans, barges loaded with sacked barytes were towed alongside the platform. The barytes was then carried by screw conveyors into the vans.

To carry the sacked barytes to the conveyors, 125 men were employed. In addition, two drilling crews were engaged in firing the boilers, maintaining pumps and other equipment, as well as assisting in carrying the mud. A total of 7,400 bbl. of the 18-lb. mud was pumped into the well in 9½ hours, at pressure ranging from zero to 600 psi. Forty thousand sacks of barytes were required to produce the 7,400 bbl. of 18-lb. mud.

At no time during the pumping operations did indications appear at the well head of 4 Louisiana Furs that fluid was entering the bottom of the hole from the relief well. This was due to the presence of a bridge in the offending well which prevented communication between the producing zone and the surface. The success of the job was apparent however when, following the killing operation, a rig was moved to 4 Louisiana Furs and the bridge drilled out. The gas flow which had previously been encountered no longer occurred.

Dan Stauffer, acidizing engineer for Chemical Process Co., has been transferred to Odessa from Allegan, Tex.

Bart DeLaat has been appointed general manager of Brazos Oil & Gas Co., Houston, Tex.

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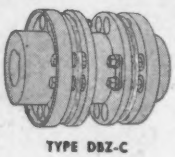
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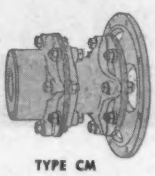
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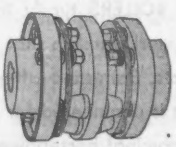
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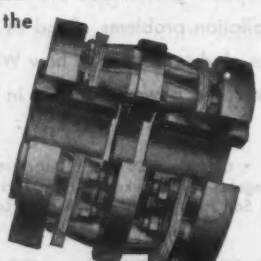
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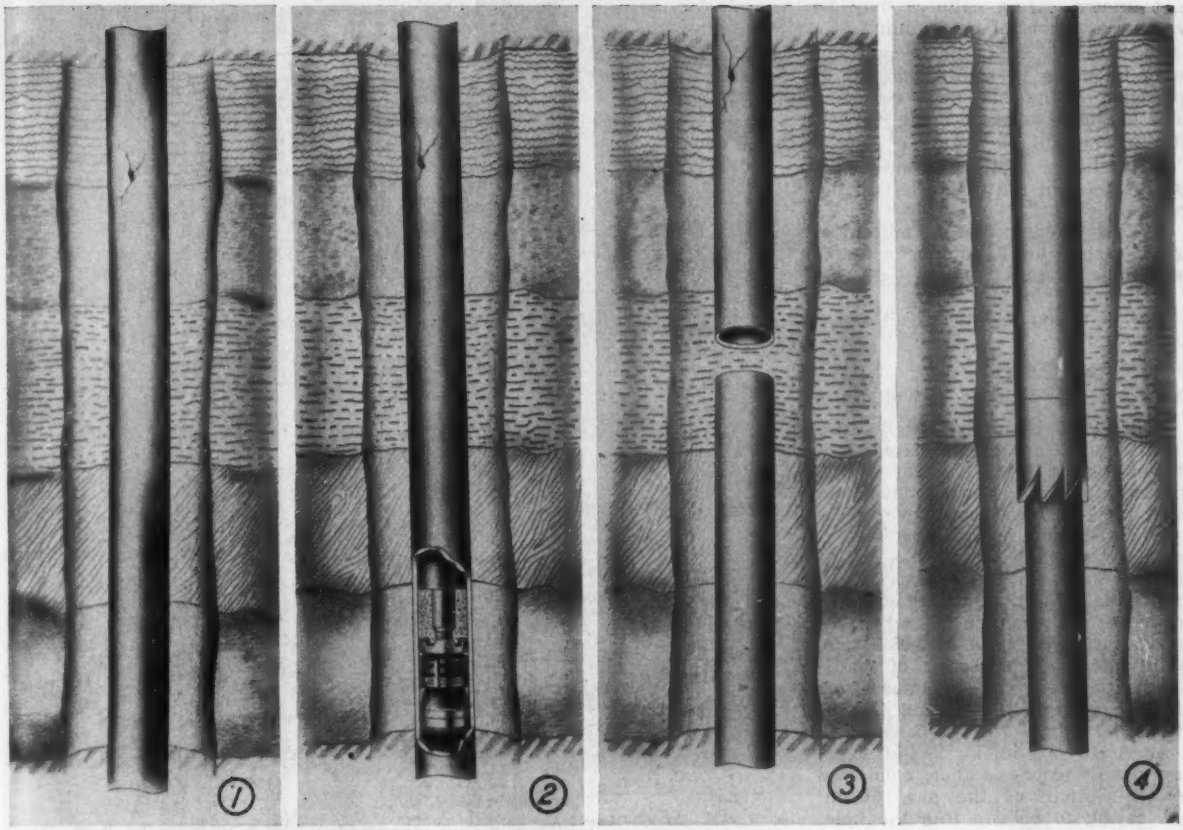


Fig. 1—Leak in casing located. Fig. 2—Cement plug set below deck. Fig. 3—Casing is cut below leak and pulled. Fig. 4—Washover string run to clear out around top of casing left in hole

Corrosion Leaks in Producing String

Successfully remedied in gas-condensate field

by Ed Short

IN the Katy gas-condensate field 28 miles west of Houston, a major company has accomplished a number of highly successful casing-repair jobs through the use of the Brown casing repair tool.

The first job of this kind performed by this company in Katy field was in its well No. 8. The results obtained in this particular case are perhaps typical of those which may be expected in future work of this kind which will probably follow the many other gas-condensate fields where corrosion of the producing string has been responsible for some highly difficult and expensive workover jobs.

The tool used in this type of remedial work simply affords a means of connecting onto the producing string with new casing, after the upper portion of corroded casing has been removed. The Brown tool is designed to obtain a strong internal flush, leakproof joint. It is applicable in case of a casing leak or severe corrosion in the casing string where it is necessary to remove a section of the pipe.

The tool consists of a guide shoe, a washover space nipple (10 to 30 ft. long), a rubber packing element to seal between the washover nipple and the casing, slip guides to hold the casing in the center of the washover pipe, and a circulation mechanism. The repair tool is attached to the bottom of the new pipe to be run into the well. It is then run and lowered over the section of good casing left in the hole. After cement is pumped into the annulus between the casing and the patch tool, a strain is taken which sets the slips and collapses the packer. After cement sets, the cement left inside of the casing is drilled out and the drilling or production operation is resumed. The slips and cement in the annulus between the washover pipe and the casing provide strength, while the rubber packing element and cement in the annulus provide a leakproof joint.

Method of Field Procedure

The removal of corroded casing and the splicing or joining to the new casing to the good portion left in the hole involves several operations as follows:

1. Kill the well.
2. Pull tubing.
3. If extent of corrosion zone in casing is already known, pipe is cut at point which will permit the removal of corroded upper section.

a. If location of corroded zone is

not known casing calipers may be run as a means of determining.

b. In some cases the second cut may be made to insure that all of corroded casing has been removed. The last cut should be made just below a coupling.

4. Washover and mill and bevel on top joint of the casing left in the hole.

5. Lower repair tool on bottom of good casing until bumper contacts with pipe in hole.

6. Cement.

7. Pull up on tool to set slips and packer.

8. Test.

As Applied to Unit No. 1, Well No. 8

Well No. 8 is approximately 7,200 ft. in depth. Casing strings consist of 9⅝-in. set at 2,443 ft., and 5½-in. set to bottom. After a leak developed in the 5½-in. casing and severe corrosion was found in the upper section of the string, the casing was cut at a point between the serious corrosion and 3,025 ft. of casing was removed. A cut was then made just below a casing coupling at 3,036 ft. A milling tool and a section of washover pipe were run to smooth off the top joint of the casing left in the hole.

An 8¼-by-5½-in. by 24.48-ft. casing repair tool was then connected to the bottom of the new 5½-in o.d. casing to be run into the hole. It was then run and lowered over the top of pipe in the hole until the seal struck the top of the fish. Circulation was then established through the patch tool. A Halliburton bottom cementing plug was used and 125 sacks of cement were pumped into the well. From 15 to 25 sacks of cement are normally sufficient; however, on this particular job enough cement was used so that it would extend from the repair tool to the bottom of the surface pipe. The cement was pumped down and the last 5 bbl. were squeezed, with 1,100 psi., leaving 50 ft. of cement in the pipe.

The pipe was then picked up and a strain of 20,000 lb. above the weight of the pipe applied. The pin holding the packing element sheared at 15,000 lb. The sealing element was then tested at 2,000 psi. After the cement plug was drilled, the repair tool was successfully tested with 3,000 psi., surface pressure. An important feature of the tool used by this company is the fact that it forms an internal flush joint with the casing in the hole, so that drilling tools or production equipment will pass freely and safely through the repaired section of the casing.

The approximate time required to repair the casing in this well amounted to a total of 10½ days as follows:

One and one-half days — Rig up workover rig.

One and one-half days—Kill well and pull tubing.

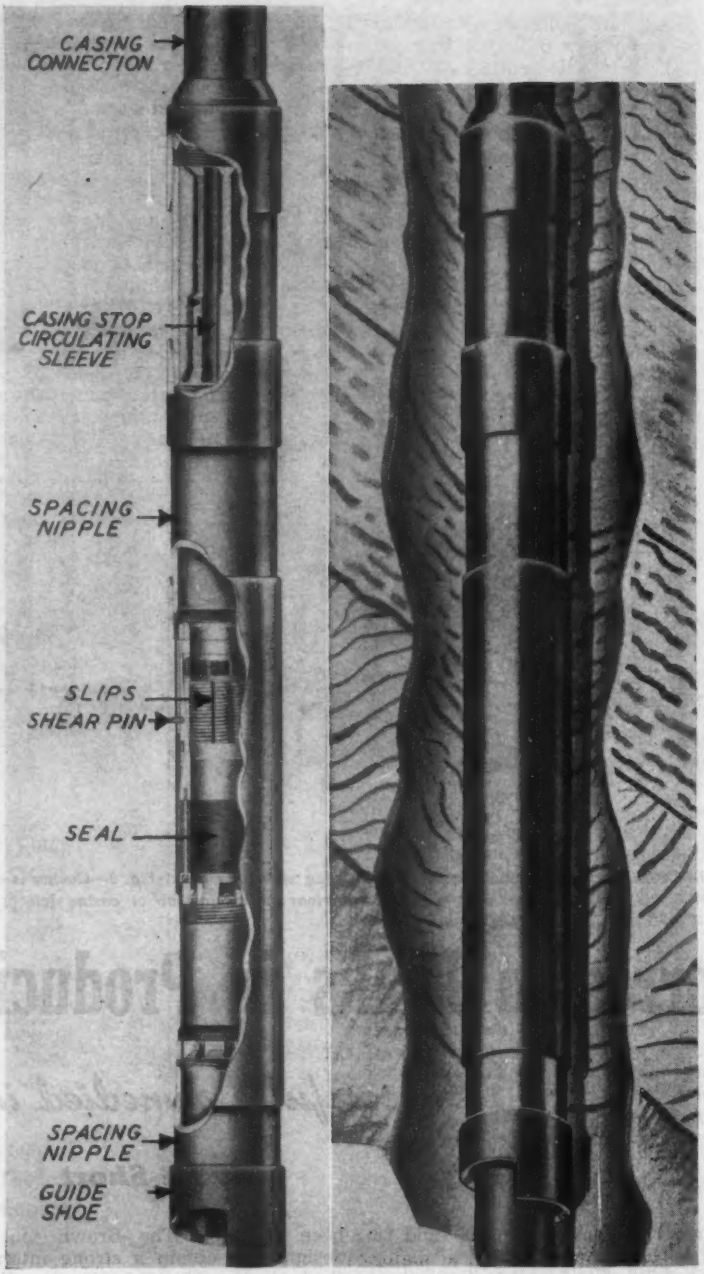


Fig. 5—(Left) Inner detail of design of repair tool. Fig. 6—(Right) In this illustration the lower end of the good casing left in hole has been joined onto the new casing by the Brown repair tool

One-half day—Testing casing below point of cut.

One-half day—Set cement retainer and squeezing off below intended cut.

Two days — Cutting and pulling casing.

One-half day—Wash over and mill off top of fish.

One-half day—Running casing and cementing repair tool.

One day—Waiting on cement to set.

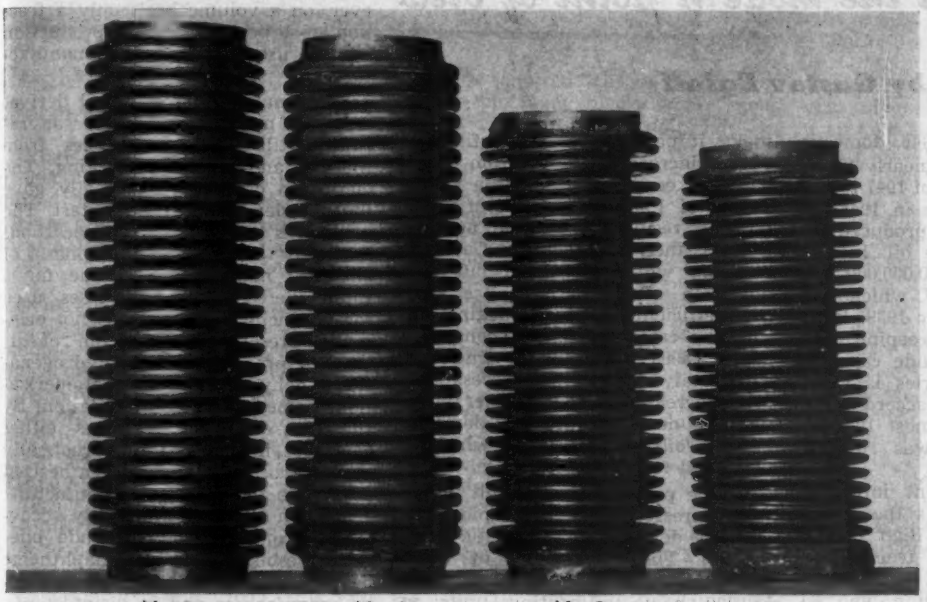
One-half day — Drill cement and condition hole to bottom.

One day—Run tubing and complete well.

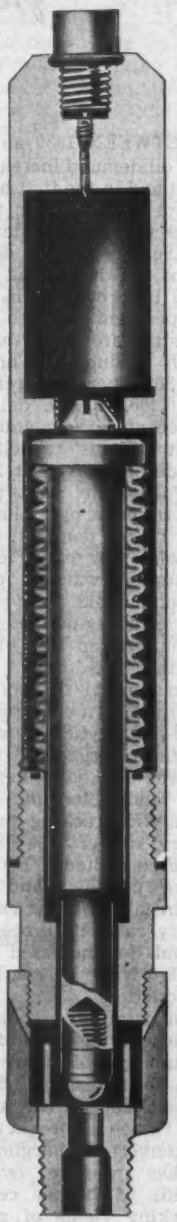
One day—Tear down.

For quite some time this company has concentrated on the problem of inhibiting the corrosion of casing and tubing in Katy field through the use of various chemicals lubricated down the casing. While a lower iron content of produced waters indicates that favorable results are being obtained, it is expected that some casing failures will continue to occur in wells where corrosion had gained headway before chemical treatment was begun.

WHY IS IT NECESSARY TO PROTECT THE BELLOWS IN A GAS LIFT VALVE?



No. 1 No. 2 No. 3 No. 4



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Bellows Nos. 3 and 4 were out of other valves, which *do not* offer bellows protection. No. 3 was tested to 2500 p.s.i.; No. 4, to 5000 p.s.i. Compare these with the original bellows . . . note the terrific compression . . . the flattened convolutions . . . *think how erratic and inconsistent would be the action of a gas lift valve that depended upon such bellows.*

At right is shown a GOT-OLSCO Type "O" Valve, with the bellows *fully protected against pressure differentials* by the sealed fluid column shown in red. *All* GOT-OLSCO Pressure-Controlled Valves offer this protection . . . all of them will give dependable, economical service . . . service that *cannot* be impaired or affected by high gas or hydrostatic pressures in the well.

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REFINING—

from the modern point of view

by Gustav Egloff*

BETWEEN 1939 and 1946, domestic oil demand increased nearly 45 per cent and in the first half of 1947 it was 10 per cent higher than in 1946. In 1939 the United States produced 1,264,962,000 bbl. of crude oil. Indications are that about 1,860,000,000 bbl. will be produced in 1947, which is a 47 per cent increase over 1939. Runs to stills are more than keeping pace with production. The crude capacity of 365 operating refineries is rated at 5,400,000 bbl. daily, according to a recent survey, and almost 100 per cent of this capacity was running crude oil in August 1947.

Today the most potent influence on refinery operations is the steadily rising demand for high octane gasoline for motor cars, trucks, and buses. Prewar, 15 per cent of the gasoline sold was premium and 85 per cent regular grade. Sales of premium fuel in May 1947, were 35 per cent of the total.

In general the postwar refinery is typified by a catalytic cracking plant, and a catalytic polymerization unit of sufficient capacity to convert propylene and butylenes from all cracking and reforming operations. The catalytic cracking process is of primary importance in meeting increased octane demands. Refiners have installed and are continuing to install catalytic cracking and auxiliary catalytic processes to meet demands for increased quality of motor fuels without sacrificing quantity production.

In catalytic cracking once-through yields of gasoline of from 45 to 55 volume per cent are obtained which can be increased to 55 to 65 per cent by polymerization of the olefins in the gaseous products. Recycling of unconverted charging oil frequently makes possible over-all gasoline yields of 70 per cent. In catalytic cracking yields of gasoline are less influenced by the gravity of the charging oil than in thermal cracking.

The improvements in gasolines and engines during the last 30 years are now saving the public a billion dollars a year. In addition to the dollar savings to the motorist, the use of the new processes to make high-octane gasoline has conserved our petroleum resources. These processes make it possible for the refiner to obtain increased values from every barrel of crude oil. By 1935 a yearly saving of 1,227,000,000 bbl. of crude oil had resulted from the application of thermal cracking. Catalytic cracking which has been put into operation since that time is even more efficient. Thermal cracking and catalytic cracking in 1946 conserved about 2,500,000,000 bbl. of crude oil. The catalytic cracking process also gives increased yields of other products in demand such as domestic heating oils and kerosine which is now used to power jet planes.

At the present time the oil industry is pressed to supply rapidly increasing demands for domestic heating oil. The Department of Commerce states that the production of 580,000 home oil-heating units in 1946 set an all-time record compared with 333,250 in 1941, when the trend toward oil for home heating was already pronounced. There were 2,268,000 home oil burners in operation in 1941, and 3,000,000 at the end of 1946.

Lube-Oil Production

Total United States lubricating oil-production in 1939 was 35,036,000 bbl.; in 1946, 45,645,000 bbl. Quality of lubricants is constantly improving and many products for special service are being made. Increases in capacity of present plants and the building of many new units are projected and the most modern processes are being installed.

Another recently developed commercial product of the oil industry is microcrystalline wax produced by centrifuging wax particles from lubricating-oil distillates. These waxes were formerly considered to be amorphous but have now been shown to consist of very minute crystals. They have a variety of important industrial uses. They are used to impregnate packaging material such as wax paper, bread wrappers and milk cartons. They waterproof leather and textiles so that treated shoes repel water and wear longer and canvas tents have a hundred per cent water run off.

Though of comparatively recent development, the manufacture of chemicals from petroleum is one of the more important phases of present-day refining. In 1935 only 1 oil company was listed as a manufacturer of chemicals while in 1946 over 50 were so classified. In 1925 the annual production of chemicals (principally isopropyl alcohol) from petroleum was less than 150,000 lb. In 1946 nearly 4,000,000 lb. of a great variety of products were manufactured, exclusive of benzene, toluene, xylenes, and other aromatics. However, on a volume basis only a fraction of 1 per cent of oil production is now used for chemical manufacture.

Large numbers of chemical derivatives are made from natural gas, refinery still gases, and gases from thermal and catalytic cracking. The olefins in cracked gases really gave the petroleum industry its start. The utilization of the liquid hydrocarbons has only begun and this phase of chemical manufacture is due for a rapid increase. The processes used for producing hydrocarbons not originally present in petroleum or its cracked products include hydrogenation, dehydrogenation, polymerization, isomerization and alkylation. By the use of these processes either singly or in combination, practically any hydrocarbon can be synthesized as a base for chemical manufacture.

Oxygen compounds directly recoverable from petroleum include phenols, cresols, xylols, and naphthenic acids. The phenols are used in plastic manufacture and in disinfectants. Ten million pounds of cresols were recovered from petroleum in 1945, which was about 35 per cent of total United States production. Naphthenic acids recovered in 1945 amounted to 30,000,000 lb. and their uses included fungicides, high-pressure lubricants, rust preventatives, paint driers, and textile preservatives.

The olefins in cracked gases furnish a series of alcohols, ketones, and industrial solvents. From the ethylene in cracked gases 60,000,000 gal. of ethyl alcohol are made yearly. From propylene about 75,000,000 gal. of isopropyl alcohol are produced. From this alcohol dehydrogenation produces acetone, a solvent for many industrial uses. Butylenes furnish methylethylketone, a dewaxing solvent.

The major portion of our synthetic detergents or soapless soaps are made from petroleum-derived hydrocarbons. In one process benzene is alkylated with 10 to 16 carbon atom olefins and the alkylated products sulfonated. Detergent compounds are also made by sulfonating high-molecular-weight paraffins and by reacting sulfuric acid with high-molecular-weight olefins or alcohols. Manufacture of these soapless soaps is a rapidly growing commercial development. In 1946, 125,000,000 lb. were produced, and 1947 production is expected to more than double that figure. In the next few years it is possible that there will be produced a billion pounds of synthetic detergents representing 25 per cent of our annual soap production.

*Universal Oil Products Co., Chicago. Summary of presentation at the Denver regional meeting, A.I.M.E., September 28-October 2.

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Height of Solvent Treating Towers

What is the most suitable method of calculating the height of tower required for liquid-liquid extractions such as propane deasphaltizing or furfural extraction of lubricating oils?—D. R. F.

Generalized information on the design of solvent treating towers is not adequate and hence laboratory or pilot-plant studies must be employed. This situation arises because petroleum oils cannot be analyzed satisfactorily with respect to the degree of extraction attained. The feed and products consist of a whole series of materials, each of which is extracted to a different degree and we are only able to measure the over-all changes in the properties of the mixtures that are separated from the feed. This difficulty, coupled with the fact that the physical properties of the liquids (viscosity, density, surface tension, etc.) and various mixtures of them are greatly altered by temperature, makes precise computation of tower heights or sizes almost impossible. In time, analysis methods will become available but no doubt many years will be required.

Design Procedure

Meanwhile, towers must be built and meager general information can be consulted. The procedure of design involves the following:

1. Laboratory studies of the behavior of the particular oil and solvent. This should be compared with similar studies in the technical literature.

2. These data should be plotted on triangular coordinate paper so that the number of theoretical equilibrium contacts required can be computed. Among the many places where such computations are discussed are Perry's Handbook (Ref. 1), Science of Petroleum (Ref. 2) and Sherwood (Ref. 3).

3. Study the specific situation, the type of towers or packings available, and select a conservative height equivalent of a theoretical plate from such literature as is available.

Efficiencies of plate-type are usually quite low. For a perforated plate column Moulton and Walkey (Ref. 4) found efficiencies under 9 per cent for methyl ethyl ketone, water, and gasoline-like hydrocarbons. Occasionally, efficiencies up to 50 per cent are attained.

The situation with respect to height equivalent of a theoretical stage (H.E.T.S.) are indicated in Table 1. The only data on large-diameter towers (Ref. 10) appear to indicate that countercurrent extraction is not very effective in large-diameter towers. So-called "spinner columns" were studied by Ney and Lochte (Ref. 13) and were found to be more effective than columns packed with berl saddles.

Theoretically Perfect Contacts

In most commercial lubricating-oil operations, two to four theoretically perfect contacts are usually considered to be sufficient. Bryant, Manley, and McCarty with respect to furfural extraction, state:

"The extraction tower is packed with about 20 ft. of raschig rings, with redistribution means at about each 4 ft. of packed-tower space. Charge rates should average about 35 gal. of charge oil per hour per square foot of over-all tower cross-sectional area, although rates as high as 70 gal. per sq. ft. per hour have been used without excessive mechanical entrainment of solvent with refined oil."

Ebner and Mertens (Ref. 15) reports a furfural tower which contains eight nests of raschig rings each 5 ft. in depth with specially designed redistribution plates above each nest. Finally, J. C. Elgin (Ref. 16) states with respect to plant towers:

"Packed and spray towers up to 60 ft. high are employed in the extraction of acetic acid from water with solvents such as isopropylether and ethyl acetate. In refining kerosines with liquid sulfur dioxide, ring-packed towers 30 ft. high and 3 ft. in diameter are used. A 12-ft.-high experimental tower packed with 1-in. rings has been found to be equivalent to three to six theoretical stages in extracting lubricating oil with furfural at 200° to 220° F. and to handle from 400 to 1,700 gal. of oil per hour per square foot of tower cross-section. Plant towers for this process are 7 ft. in diameter and packed with 1½-in. rings. Packer towers 4 ft. in diameter and 60 ft. high with packing arranged in 4-ft. sections with 2 ft. of free space between (to prevent flooding) are in use for treating 250 bbl. of gasoline with 40 bbl. of caustic soda solution per hour. Similar towers 5½ ft. in diameter and 60 ft. high with the continuous packed section equal to 50 per cent of the height can handle 450 bbl. of gasoline per hour countercurrent to 15 per cent by volume of caustic soda solution.

"Vulcan Copper & Supply Co. has designed and built continuous extraction columns having a total feed capacity for a single unit of 16,000 gal. per hour with a density difference of 0.187 grams per cc. Each tower has an extraction efficiency equivalent to at least six transfer units, and is designed with large free openings to avoid difficulty due to clogging."

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1. Perry, J. H., Chemical Engineers Handbook, 2nd Ed., pages 1213-1268 and particularly page 1265, McGraw-Hill Book Co., Inc., New York, 1941.

2. Dunstan et al, Science of Petroleum, Vol. 3, Sections 26, 27, 28, and 29, Oxford Univ. Press, New York, 1938.

3. Sherwood, T. K., Absorption and Extraction, McGraw-Hill Book Co., Inc., New York, 1937.

4. Moulton and Walkey, Liquid-Liquid

TABLE 1—DATA ON EFFICIENCY OF EXTRACTION COLUMNS ON A BASIS OF H.E.T.S.

Size of column	Packing, etc.	Materials	H.E.T.S. (ft.)	Ref. No.
5 ft. by 3.56-in. dia	perforated plate—3-in. spacing	benzoinacid-toluene-water	*0.96-8.56	5
	perforated plate—6-in. spacing	benzoinacid-toluene-water	*2.59-7.36	
	perforated plate—9-in. spacing	benzoinacid-toluene-water	*2.98-8.20	
5 ft. 6 in. by 3.55-in. dia.	½-in. carbon rings	acetic acid-water benzene	†2.0-5.4	6
	½-in. berl saddles	acetic acid-water-benzene	†2.2-3.0	
	1-in. carbon rings	acetic acid-water-benzene	†2.4-3.0	
	spray—no packing	acetic acid-water-benzene	†3.0-3.9	
9.84 ft. by 0.55-in. dia.	4-mm. metal rings	alcohol-benzene-water	2.46-4.7	7
6 ft. by 3-in. dia.	0.25-in. to 1-in. rings, rods, and saddles	lube oil-nitrobenzene	1.48-5.4	8
3.28 ft. by 1.57-in. dia.	10-mm. glass rings		under 3.38	9
1.64 ft. by 1.57-in. dia.	internally stirred	several	0.16 to 0.82	9
13.1 ft. by 2.95 ft. dia.	sieve plate	water-phenol-benzene	5.5-21.2	10
46 ft. by 4.92 ft. dia.	sieve plate	water-phenol-benzene	23.6-209.0	10
48.75-in. by 2.03-in. dia.	spray—no packing	acetic acid-water-isopropylether	1.5-4.5	11
5 ft. by 2.03-in. dia.	spray column	toluene-water-benzoic acid	2.4-27.0	12
	packed column	toluene-water benzoic acid	4.0-7.3	

*H.T.U. based on water concentration. †H.T.U.

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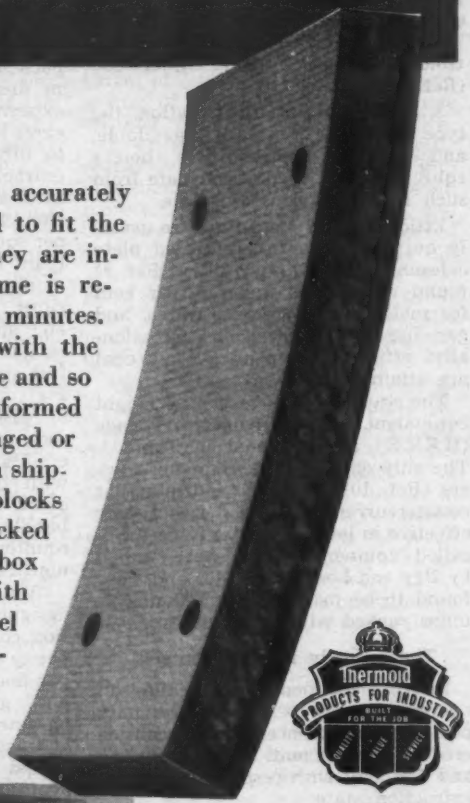

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Extraction in a Perforated Plate Column, Trans. A.I.Ch.E. XL, 695 (1944).

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Diesel-Engine Developments

(Continued from page 190)

Fig. 7 shows an interesting comparison of fuel consumption of the supercharged dual-fuel engine as compared with the straight diesel and the conventional spark-ignition gas engine. These comparisons are on the basis of B.t.u. content of the fuel per brake horsepower hour. Of course the economics of drilling fuels depend on the cost of gas and oil and the cost of gas particularly may vary over a wide range.

It may be noted that either the straight diesel or the dual-fuel diesel is more efficient than the spark-ignition gas engine. At full load the saving amounts to 25 per cent for dual fuel. This is due to the high-compression operation on the diesel cycle. At loads above 75 per cent the dual-fuel engine is even more economical than the straight diesel and at full load this saving amounts to about 17 per cent. This is probably due to the excellent combustibility of the gaseous fuel.

From a technical standpoint it is also interesting that the higher percentage of pilot fuel used on the drilling engine results in increased conomy over minimum pilot fuel used under controlled conditions.

These curves also show the relative exhaust temperatures of each of these three engines. On account of the better utilization of fuel it is to be expected that the exhaust temperature of either diesel will be well below that of the conventional gas engine and that of the dual-fuel diesel somewhat below the straight diesel engine.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Petroleum Conversion Units—K-Z

Other conversion units (A through J) appeared in The Refiner's Notebook 164 of October 4, 1947.

Barrel as used here always means a 42-gal. or oil barrel.
Gallon unless otherwise noted means a U. S. gallon.

Kilogram = 2.2046 pounds
Kilogram calorie = 3.968 British thermal units
Kilogram meters per second = 0.809 watt
Kilogram per square cm. = 14.223 pounds per sq. in.
Kilometer = 3,281 feet
Kilometer = 0.6214 mile
Kilowatt hour = 3,415 British thermal units
Kilowatt hour = 1.341 horsepower

Link (surveyor's) = 7.92 inches
Liter = 0.2642 gallon
Liter = 1.0567 quarts

Meter = 3.281 feet
Meter = 100 centimeters
Meter = 1.0936 yards
Meter = 39.37 inches
Micron = 0.00003937 inch
Micron = 0.001 millimeter
Mil = 0.001 inch
Mile = 5,280 feet
Mile = 1.6093 kilometers
Mile = 1,900.8 varas (Texas)
Mile per hour = 1.4667 feet per second
Mile per hour = 1.609 kilometer per hour
Millimeter = 1,000 micron
Millimeter = 0.1 centimeter
Mol vol. of gas = 22.41 liters at 0° C. & 760 mm.
Mol vol. of gas = 359.0 cu. ft. at 32° F. & 14.7 psia.
Mol vol. of gas = 379.4 cu. ft. at 60° F. & 14.7 psia.

Ohms per kilometer = 0.3048 ohms per 1,000 feet
Ohms per 1,000 feet = 3.2808 ohms per kilometer
Ounce (avoirdupois) = 437.5 grains
Ounce (avoirdupois) = 28.3495 grams

Part per million = 0.05835 grain per gallon
Part per million = 8.345 pounds per million gallons
Pood (Russian) = 36.112 pounds
Pound = 7,000 grains
Pound = 0.4536 kilogram
Pound per square inch = 2.309 feet of water at 60° F.
Pound per square inch = 2.0353 inches of mercury
Pound per square inch = 51.697 mm. of mercury
Pound per square inch = 0.0703 kilogram per sq. cm.
Pound per million gal. = 0.00700 grain per gallon
Pound per million gal. = 0.11982 parts per million

Quart (liquid) = 0.946 liter
Quintal (Venezuelan) = 101.432 pounds
Quintal (Mexican) = 101.467 pounds

Rod = 16.5 feet
Rod = 25.0 links

Sack cement (set) = 1.1 cubic feet
Square centimeter = 0.1550 square inch
Square foot = 0.0929 square meter
Square foot = 0.1296 square vara (Texas)
Square inch = 6.452 square centimeters
Square kilometer = 0.3861 square mile
Square meter = 10.76 square feet
Square mil = 1.2732 circular mil
Square mile = 2.590 square kilometers
Square vara (Texas) = 7.716 square feet

Temperature Centigrade = 5/9 (Temp. °F. minus 32)
Temperature Fahrenheit = 9/5 (Temp. °C. plus 32)
Temperature (°C. plus 40) = 0.555 (°F. plus 40)
Temperature (°F. plus 40) = 1.8 (°C. plus 40)
Temperature Absolute C = Temp. °C. plus 273
Temperature Absolute F = Temp. °F. plus 460

Ton (long) = 2,240 pounds
Ton (metric) = 2,205 pounds
Ton (short or net) = 2,000 pounds
Ton (metric) = 1.102 tons (short or net)
Ton (metric) = 1,000 kilograms
Ton (metric) = 6.297 barrels of water at 60° F.
Ton (metric) = 7.454 barrels (36° A.P.I.)
Ton (refrigeration) = 200 British ther. units per min.
Ton (short or net) = 0.907 ton (metric)

Vara (Texas) = 2.7778 feet
Vara (Texas) = 33.3333 inches
Vedro (Russian) = 3.251 gallons
Viscosity centipoise = 0.000672 poundal seconds per square foot
Viscosity centipoise = 2.42 pound mass per foot hour

Watt = 44.25 foot pounds per minute
Watt = 0.001341 horsepower
Watt-hour = 3,415 British thermal units

Yard = 0.9144 meter

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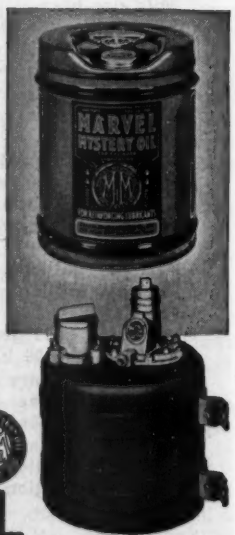

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Compounding of Engines: Types of Arrangements

THE question of proper distribution of power in a mechanical-drive rig, powered by internal-combustion engines, is not only that of providing the rig with needed flexibility, but also that of economy. Because of this fact the preferred solution is to make available to all the functions of the rig the power of two or more engines. This is done through use of different types of compounding arrangements. This solution provides power for peak load sand emergencies, and in case of more than two engines being used, usually permits continuation of operations if one of the engines is down for repairs.

Independent rotary drives which are being used because of certain special advantages they offer are an exception. (Installment 32). Independent pump drives are also being employed. They represent, however, an investment in power which may be used for only one specific purpose. This investment would be considerable in case of deep drilling, in view of the size of pumps now being used.

Total horsepower of different size rotary rigs is pretty well standardized and agreed upon. There are, however, two schools of thought in regard to the size of the individual engines to be used in compounding, which together furnish the total of power needed. Some designers and operators prefer to use a smaller number of large engines. Others contend that a larger number of small engines is more satisfactory and efficient. Each of the solutions has its advantages and its disadvantages. As far as the initial investment in the prime movers is concerned, there is little difference between the two arrangements.

Use of a small number of large engines reduces the number of units to be maintained, dismantled, and moved. It results also in simpler compounding equipment. On the other hand such arrangement may under certain conditions, furnish an excessive amount of power, reducing the efficiency of operation. For instance, while one engine may not be capable of driving the pump, compounding of two large engines may supply much more power to the pump than is actually needed.

Greater Flexibility

When a larger number of smaller is employed, more units have to be maintained and moved and the compounding equipment becomes more complicated and expensive. However, there is considerably more flexibility in assigning to different function of the rig fractional parts of the total available power.

Manner of compounding of individual engines is being solved in different ways by different designers. No details of variations can be discussed here. However, the following is the general outline of the principles involved.

Two-engine compounding.—In this arrangement both engines are compounded for hoisting (Fig. 39-A). While drilling, one engine, the No. 1 engine nearest to the draw works, drives the rotary, while engine No. 2 drives the pumps. If the power of one engine is not sufficient to operate the pump, the engines are compounded for the pump and also for drilling. This results in mechanical linkage of actions of the rotary and of the pumps. Different rotary-drive speeds are then used to control operation of the rotary.

Three-engine compounding.—Much greater flexibility of power distribution is obtained by use of three-engine compounding. One solution of such an arrangement is shown schematically in Fig. 39-B.

For hoisting, all three engines may be compounded. The size of the individual engines is selected in such a manner in relation to the intended capacity of the rig, that engine No. 1, alone, is capable of driving the rotary. Then either engine No. 2 or engine No. 3 or both engines compounded may be used for operation of the pump or pumps.

Compounding of four engines and the compounding transmissions are the subject of the following installment of this series.

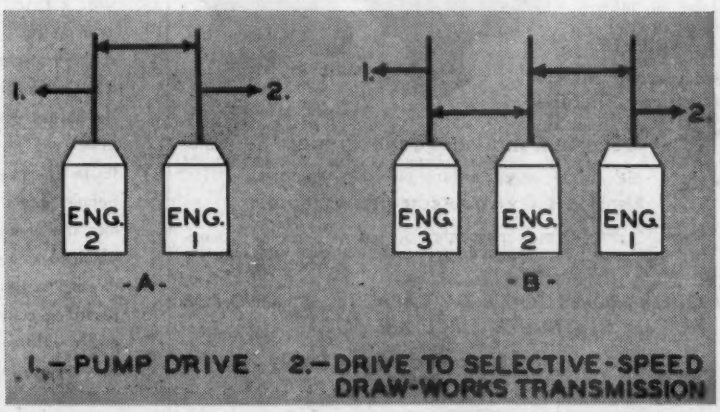

Fig. 39—Schematic sketches of two and three-engine compounding arrangements

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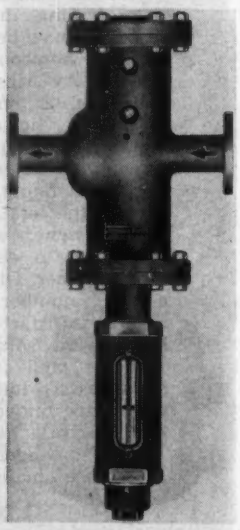

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ENGINEERING *fundamentals*

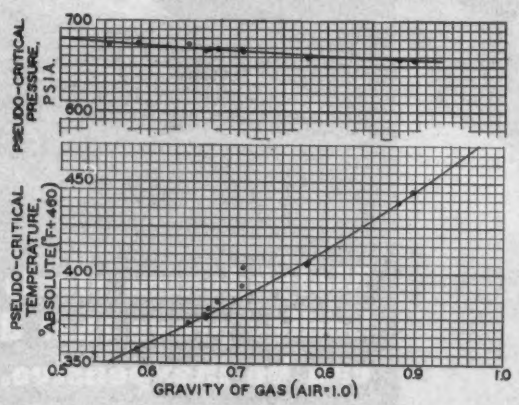
Specific-Gravity Correlations

GASEOUS mixtures, such as natural gases, are characterized, strictly speaking, only by a detailed analysis of components. Such data are often not known or are obtained only at great expense and it is convenient to be able to characterize natural gases by some simpler means. One correlation is that between specific gravity and pseudo-critical temperature. Another is that between specific gravity and pseudo-critical pressure. A third is that between specific gravity and percentage of methane or methane plus ethane.

Figs. 1 and 2 are correlations as given in the Fifth Technical Manual of the Natural Gasoline Supply Men's Association. The use of these correlations rules out the necessity of a detailed calculation of pseudo-critical values from the percentage composition analysis of a gas. It must be noted that these correlations are good only for natural gases which are predominantly methane and which contain very few impurities. Gases having more than 5 per cent of impurities (nitrogen, carbon dioxide, hydrogen sulfide, etc.) are not very likely to follow the relationships too closely.

Another sometimes useful correlation is that between specific gravity and percentage of methane or percentage of methane plus ethane. Fig. 3 shows the trend followed by such correlations, and is based upon the analyses of a number of actual natural gases which were principally methane and substantially free of impurities. This empirical relationship cannot be regarded as being so exact as those in Figs. 1 and 2. Individual gases may depart considerably from the trend.

A calculation of pseudo-critical values by the more detailed method and then by use of Figs. 1 and 2 will indicate in some measure the reliability of these correlations. In the accompanying table are listed the percentage compositions of three gases and computations for the specific gravity, pseudo-critical temperature, and pseudo-critical pressure of each. Using the specific gravity, values of pseudo-critical temperature and pressure, as read from Figs. 1 and 2, are in good agreement with those calculated by the more detailed process. For Gas 1, by the extensive calculation, P_c = 672 psia. and T_c = 362° R. From Figs. 1 and 2, using Sp. Gr. = .610, P_c = 672 psia. and T_c = 363° R. For Gas 2, by the extensive calculation, P_c = 639 psia. and T_c = 379° R, and for Gas 3, P_c = 673 psia. and T_c = 392° R. For both of these gases, using Sp. Gr. = .701, Figs. 1 and 2 give P_c = 667 psia. and T_c = 385° R. For both the value of T_c is in good agreement, but P_c is in better agreement for Gas 3 than for Gas 2. This is no doubt due to the amounts of nitrogen and carbon dioxide shown in the analysis. For this gas the per cent of methane versus specific gravity falls somewhat below the correlation of Fig. 3, and it would therefore be expected that the estimation of P_c and T_c from specific gravity would be slightly off.



Figs. 1 and 2

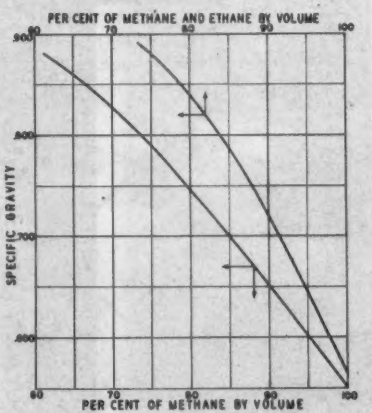


Fig. 3

Component—	Mol. wt.	T_c	P_c	Gas No. 1,* sp. gr. = 0.610 % by vol.	% × mol. wt.	% × P_c	% × T_c	Gas No. 2,† sp. gr. = 0.701 % by vol.	% × mol. wt.	% × P_c	% × T_c	Gas No. 3,‡ sp. gr. = 0.701 % by vol.	% × mol. wt.	% × P_c	% × T_c
Methane	16.04	343.5	673	93.40	14.98	629	321	79.08	12.70	5.32	272	82.55	13.25	556	284
Ethane	30.07	550.1	708	3.85	1.16	27.3	21.2	8.71	2.62	61.7	48	9.01	2.71	64	49.6
Propane	44.09	666.2	617	1.33	0.59	8.2	8.9	3.29	1.45	20.2	21.9	4.62	2.04	28.5	30.8
i-Butane	58.12	733.2	530	0.46	0.26	2.5	3.4	0.43	0.25	2.3	3.2	0.74	0.43	3.9	5.4
n-Butane	58.12	765.6	551	0.38	0.22	2.1	2.9	0.98	0.57	5.4	7.5	1.26	0.73	7.0	9.7
i-Pentane	72.15	830.0	842	....	....	....	....	0.43	0.31	2.1	3.6	0.32	0.23	1.5	2.6
n-Pentane	72.15	847.0	485	....	....	....	....	....	....	....	....	0.22	0.16	1.1	1.9
Pentanes+	72.15	840	484	0.58	0.42	2.8	4.9	....	....	....	....	....	....	....	....
Hexanes	86.17	914	434	....	....	....	....	0.17	0.15	0.7	1.6	....	....	....	....
Hexanes+	86.17	914	434	....	....	....	....	....	....	....	....	0.38	0.33	1.6	3.5
Heptanes+	100.20	952	400	....	....	....	....	0.10	0.10	0.4	1.0	....	....	....	....
CO_2	44.0	548.0	1,073	....	....	....	....	1.46	0.64	6.9	8.0	0.90	0.40	9.6	4.9
N_2	28.02	227.2	492	....	....	....	....	5.33	1.50	7.4	12.1	....	....	....	....
				100.00	17.63	671.9	362.3	99.98	20.29	639.1	378.9	100.00	20.28	673.2	392.4

*From Gloyd zone, Rodessa field, page 79, "Secondary Re covery in Arkansas," Arkansas Oil and Gas Commission. †From Jones sand, page 224, Ibid. ‡From Paloma field, A.I.M.E., V ol. 160 (1945) Olds, Sage and Lacey.

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma

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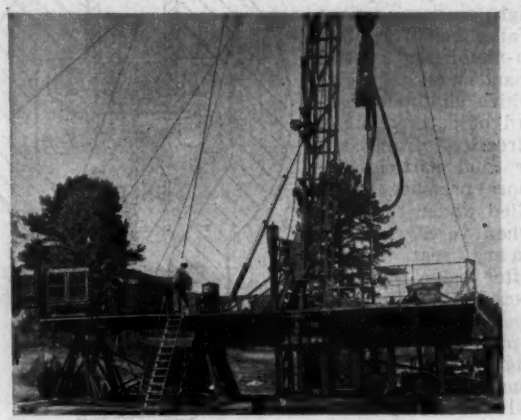
MOLY

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by John M. Spears

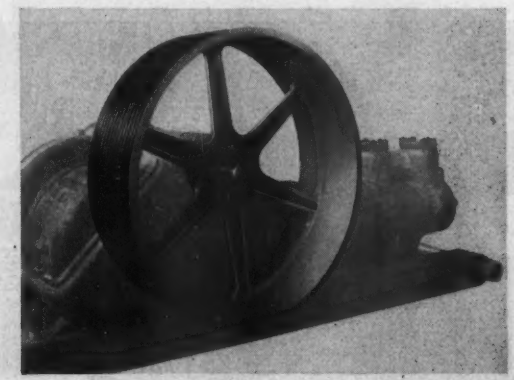
(1) HY-LIFT RAMS elevate entire rig to permit placing a substructure. Semitrailor-mounted Hydrair hoist with Kwik Lift mast (illustrated) is equipped with four hydraulic rams, one mounted at each corner. Rams will lift entire unit 8 ft. in a single stroke and provide a floor elevation of 9 ft. Centralized control permits



proper coordination of the four rams. Safety measures have been provided for proper lowering of rig. Entire unit can be raised from ground level to full ram extension in 8 to 10 minutes. Special A-frame substructure is provided to support unit and is positioned when rams are fully extended. Rig is then lowered to rest on substructure. Mast is raised by hydraulic power to upright position where it rests on a two-section substructure that also supports the rotary and the setback mat. Features of ram system are saving in time required for rigging up and reduction in weight in substructure requirements. *International Derrick & Equipment Co.*

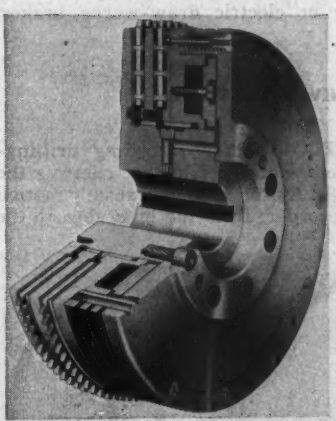
IT'S NEW CHECK IT

(2) QD SHEAVES for mud-pump applications feature improved groove-belt fit and reinforced-arm construction. Designated as the A and B lines, each will feature individual groove size to match belt size—thus an A groove for an A belt, a B groove for a B belt. Reinforced-arm construction incorporates a longitudinally ribber arm recessed down the middle. Advantage is that material is removed at or near the neutral axis where it



adds little or no strength to the arm, and added at the points most remote from the neutral axis where it gives the greatest strength. *Worthington Pump & Machinery Corp.*

IT'S NEW CHECK IT



(3) AIR-ACTUATED CLUTCH for drum drives and other drilling applications, has torque ratings from 900 ft.-lb. to 89,550 ft.-lb. in sizes from 14 to 42 in. with capacities from 75 to 1,325 hp. High torque ratings have been obtained by modifying basic air-operated clutch design to permit increased air-cylinder areas. Clutches are equipped with heavy new-type spline-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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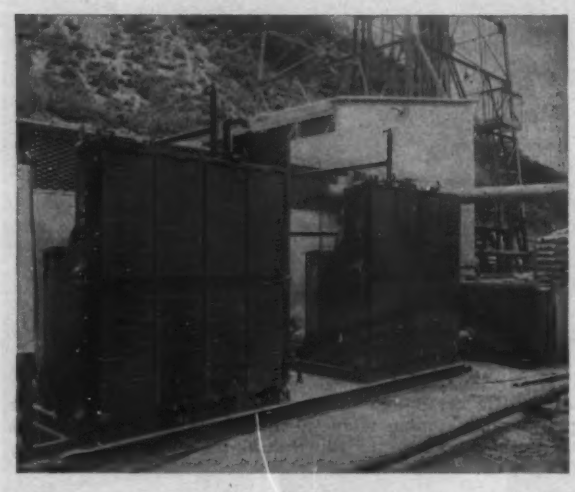
tooth construction on clutch hub, center plates, and floating plates. Units operate by remote control. Air pressure may be applied to friction plates for either slow or fast engagement. *Twin Disc Clutch Co.*

IT'S NEW CHECK IT

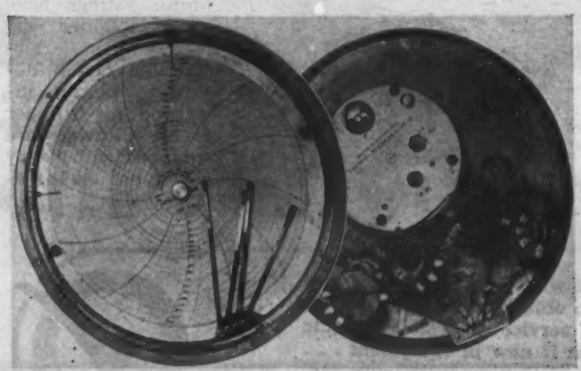
(4) JACKET WATER COOLERS are located remotely instead of mounted directly to engines of a drilling rig. Coolers handle jacket water and also cool the circulated lubricating oil. Cooler units are on separate skids and are



easily moved. Principal advantage is power savings in fan loads. Also removes a great deal of heat within rig, and increases safety factor by eliminating high-speed-fan noise. Coolers can be tied in to the cooling circuit of either the hydromatic or electric draw-works brakes. *Young Radiator Co.*

IT'S NEW CHECK IT

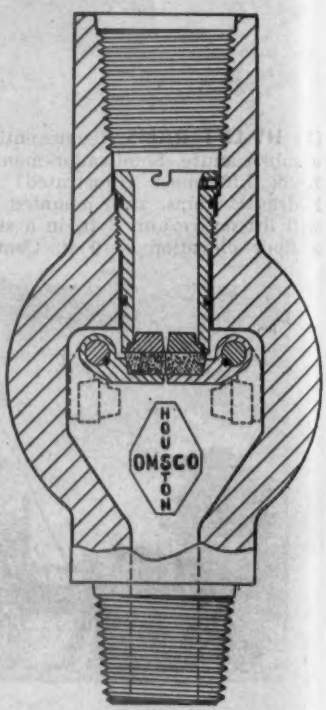
(5) STRATAGRAPH RECORDER for recording drilling-rate data, works on the same principle that controls the guns on the Army B-29s. Sylsen motors transmit motion from the scale to the recorder; from the mud gage to the



recorder; from the kelly governor to the recorder; and from the transmission footage counter. Recorder chart shows at all times the reading on the scale dial; the weight on the bit; the kelly speed; the mud pressure; and the footage. Records are all within 2 minutes of each other. This record shows the rate of penetration—that is the footage in a 10-minute interval, and any and all variations in the rate of penetration. There is no lag in the action of Sylsen motors. Charts are 12 in. in diameter and illuminated. *Line Scale Co.*

IT'S NEW CHECK IT

(6) NEW KELLY VALVE features fast, easy operation due to elimination of friction areas. Valve requires no lubrication. Ram shafts ride in chevron packing. Kelly valve can be completely redressed in the field; rams and valve seat are easily replaced right on derrick floor. Valve has a rubber-to-metal seal, rather than metal to metal, which eliminates hazard of cutting out or "freezing" from sand or mud particles. As more pressure is applied under the rams when valve is closed rams seat tighter. After valve has been closed, it can be opened again without a member of the drilling crew opening it manually. To open valve it is only necessary to start the pumps and pump pressure will open the rams. *Oilfield Machine & Supply Co.*



IT'S NEW CHECK IT

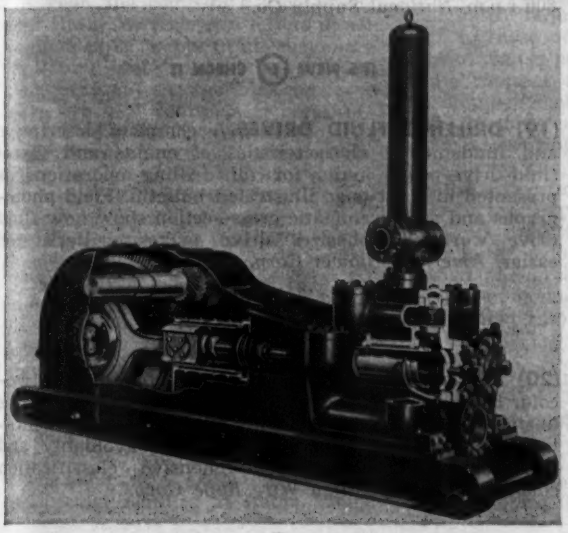
(7) CRANEMOBILE (for handling oil-field lifting requirements) is a heavy-duty crane mounted on a specially engineered carrier. Unit has a nominal crane

rating of 20 tons at 10-ft. radius with 30-ft. boom over side or end with outriggers set. It is convertible and may be used as crane, clamshell, dragline, and pile driver. Carrier is of the six-wheel, three-axle type, all-wheel drive and equipped with 10 heavy-duty pneumatic

tires providing added mobility and flexibility for high-speed road travel and off-the-road service. Complete with cab-over-engine, heavy-duty chassis, and outriggers, carrier will withstand all strains and impact stresses resulting from excavating or handling of heavy loads. *Bay City Shovels, Inc.*

IT'S NEW CHECK IT

(8) ALL-STEEL SLUSH PUMPS feature extremely high horsepower capacity per unit of weight. Cast-steel fluid end and fabricated-steel power end reduces over-all pump weight. All-steel construction makes it possible to repair any fluid cut, abrasion, or "washout" without removing fluid end from frame. Welding and machining



can be accomplished right in the field. "Exposed" liner construction brings fluid liners into view for approximately 90 per cent of their length, making it possible to detect any small mud leaks through or around the liners while pump is in operation. Power end is of fabriform construction. Pump skid is constructed as an integral part of power frame. Pinion and pinion shaft are forged as one piece, and are made of heat-treated alloy steel. Main gear is of the herringbone type. *Emsco Derrick & Equipment Co.*

IT'S NEW CHECK IT

(9) ELECTRIC PLANT is an important accessory for night lighting on all drilling derricks. Plant is capable of operating more than 10 hours per day generating power for as many as fifty 100-watt lamps. Control panel is fitted with a standard duplex receptacle for plugging in electrical tools. Remote starting permits plant to be started from any point on the location that is within 250 ft. of the plant. *D. W. Onan & Sons, Inc.*

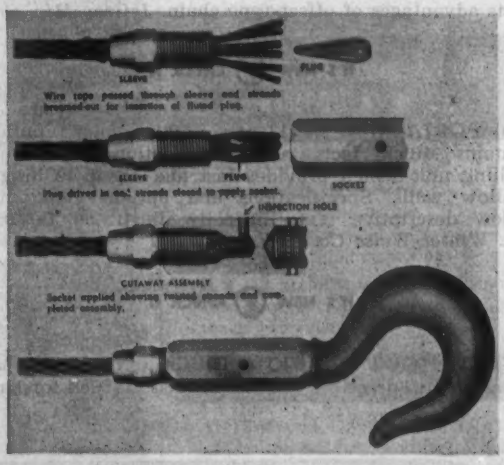
IT'S NEW CHECK IT

(10) PULSATION DAMPENER cuts surge and shock of oil-field mud pumps. Reduction in pulsation reduces costs by cutting horsepower loss, repairs and services, parts replacement, use of bumper hose, air-cushion standpipes, and other extra equipment. Dampeners consist of one or a series of enclosed, inflated rubber cartridges coupled to the discharge line of pump. Surge generated by output stroke of pump causes the inflated rubber cell or cells to contract slightly, thus absorbing the impulse from pump stroke. With the passing of the initial surge, the rubber bladder expands to aid additionally in main-

taining a steady even flow. Cast of special alloy steel, housing and heads will withstand pressures up to 3,000 psi. A specially compounded synthetic rubber, molded to a steel mandrel, provides a tough and enduring bladder. All parts are interchangeable. *Baroid Sales Division, National Lead Co.*

IT'S NEW CHECK IT

(11) NEW HOOK-END FITTING for use on winches, derricks, draw works, etc., may be secured safely and quickly to the wire-rope ends by means of Electroline-Fiege connector which is built as an integral part of the



hook. Applied with common tools and easily checked through an inspection hole, assembly will stay on forever or can be easily removed if desired. A vibration damping effect prolongs the life of the wire rope eliminating the need of frequent resocketing. *Electroline Co.*

IT'S NEW CHECK IT

(12) PLASTIC SNAKE-BITE KIT provides rapid, dependable emergency snake-bite treatment for oil-field workers. Kit is light in weight, small, and compact—little larger than a pack of cigarettes. A four-page, three-color bulletin describes all items in kit including a special self-suction pump which utilizes the accepted scientific method for removing the venom of snake bite. Self-suction pump can be operated with only one hand, so that a victim of snake bite can apply immediate treatment without assistance. *Mine Safety Appliances Co.*

IT'S NEW ✓ CHECK IT

(13) MODEL 2500 DRILLING UNIT. A 14-page bulletin describes a compact, streamlined, portable drilling unit designed to handle 30,000-lb. drill pipe load. Descriptive material includes specifications, suggested operating equipment, and list prices. Punched for loose-leaf binding. *George E. Failing Supply Co.*

IT'S NEW ✓ CHECK IT

(14) TRUCK & TRAILER SIZE AND WEIGHT RESTRICTIONS. A compilation of laws and regulations limiting the size and weight of trucks and trailers in each state is contained in easily read 51-page booklet. All interpretations have been checked and approved by officials in the respective states. A must for contractors and truck users throughout the country. *Four Wheel Drive Auto Co.*

IT'S NEW ✓ CHECK IT

(15) CHAINS AND SPROCKET RIMS for all drilling operations are covered in 14-page, two-color catalog. Illustrations and features of construction are given for each type. Dimensions and specifications included. Lists advantages of offset-type chain. *Jeffrey Mfg. Co.*

IT'S NEW ✓ CHECK IT

(16) PORTADRILL. A 12-page, three-color bulletin contains quick facts and construction features of drilling unit which provides fast and cheap drilling of shallow wells. Specifications and optional equipment follow descriptive text. Liberally illustrated throughout. *Winter-Weiss Co.*

IT'S NEW ✓ CHECK IT

(17) CONTOUR TRACTION TRUCK. New four-page color bulletin describes a flexible traction truck for hauling drilling and oil-field equipment over wheel-stopping terrain. Emphasizes unit is the only commercial vehicle with tracks flexible enough to adjust themselves to terrain contour changes. Illustrations show how track operates over changing terrain. *Linn Manufacturing Corp.*

IT'S NEW ✓ CHECK IT

(18) DRILLING ENGINE. Superior PTD-6 and PTD-8 diesel drilling engines, their construction details and parts, are described and illustrated in new bulletin, 16 pages. Specifications, horsepower curves, and dimension diagrams showing space requirements are given. These six and eight-cylinder engines have 8½-in. bore and 10½-in. stroke, and 280 and 375 hp. respectively at 800 r.p.m. *National Supply Co.*

IT'S NEW ✓ CHECK IT

(19) DRILLING FLUID DRIVES. A complete description and fundamental characteristics of engine and Gyrol fluid-drive-power units for all drilling operations is presented in eight-page illustrated bulletin. Field photographs and a diagrammatic cross-section show how fluid drive works. Emphasizes drive makes driller's job easier. *American Blower Corp.*

IT'S NEW ✓ CHECK IT

(20) WIRE-ROPE INSTALLATION. A four-page, two-color brochure describes and illustrates wire-rope abuses during installation. Material is an educational presentation of the many ways a rope can be avoidably and unavoidably ruined. A comprehensive classification chart lists abuses. *Union Wire Rope Corp.*

IT'S NEW ✓ CHECK IT

(21) OIL-FIELD BLOCKS. Latest information on blocks for petroleum industry is carried in new catalog. Several new-type blocks are shown including the cargo-hoister block. It is a high-speed Timken-bearing block built to withstand extra severe duty. Another new product is the rotary-hose guide puller. *McKissick Products Corp.*

IT'S NEW ✓ CHECK IT

(22) SOCKETYPE CABLE TERMINALS. New specification literature describes and illustrates terminals consisting of an alloy-steel cadmium-plated eye or fork-type fitting, plus a stainless-steel sleeve for swagging to cable (wire rope). Available loose or attached to rope in a complete cable assembly to specification length. *Macwhite Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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REFINING

Contract Replacement Announced by Ethyl

AS Ethyl Corp.'s basic patent on tetraethyl lead expires at the end of this year, the company's Vice President Harry W. Kaley, in letters dated September 24, wrote to all customers explaining that "it is necessary to replace" the old contracts. A choice of three types of contracts is being offered. One is based on entire requirements; another on a percentage of requirements; and the third on a specific number of pounds. Ethyl anticipates that the total demand for T.E.L. may be greater than its 1948 capacity to supply.

Kaley explained, however, that lead supplies have eased "and in 1948 we do not expect a shortage of metallic lead or any other raw material." In view of this Ethyl expects that "next year our Baton Rouge plant will be able to ship a quantity at least equal to our total shipments from both plants in the current year."

The company is expanding its manufacturing facilities at Baton Rouge with a $20,000,000 construction program which will result in a substantial increase in capacity.

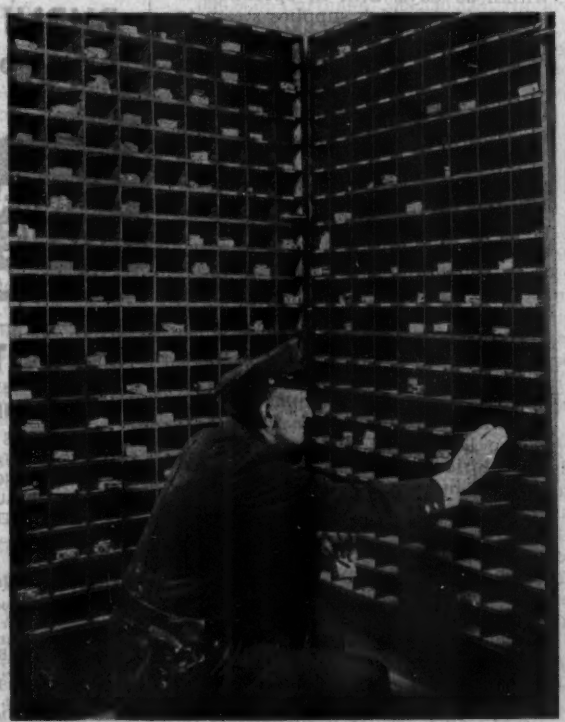
"Our present estimate," Kaley said, "is that during 1948 we will have sufficient supplies to deliver from 110 to 120 per cent of shipments during 1947 to all customers who contract for their entire requirements, and to deliver to those of our customers who elect to sign a percentage-of-requirements contract an amount equal to the shipments made to them during 1947. All these estimates are based on shipments during the first 9 months of this year."

Ethyl's vice president in charge of sales further explained that "we will not be in a position to contract to deliver to a customer who may wish to sign an agreement for a specific number of pounds an amount in excess of that shipped to him in 1947."

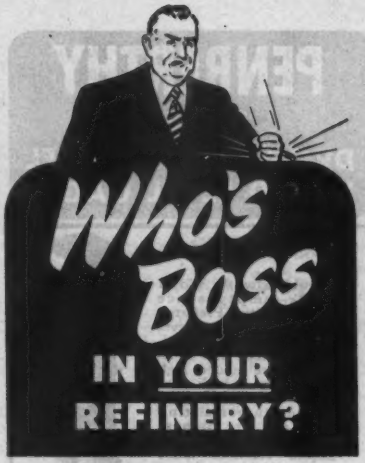
Ponca City Plant Sold to Continental

Sale of the government-owned aviation-gasoline plant in Ponca City to Continental Oil Co. for $3,125,000

EMPHASIZING SAFETY PRECAUTIONS



This photograph illustrates the precautions by which the oil industry maintains its leadership in fire prevention. It shows a guard inspecting cigarets and matches checked at a gate of Gulf Oil Corp.'s Philadelphia refinery. During the past 10 years, 100 leading oil companies established a fire-loss ratio of 0.087 per $100 insurable value as compared to the national average of 0.27. The fire prevention effort was observed nationally this week



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Are you getting maximum continuous operation, or do you shut down because of salt plugging, corrosion damage, severe coking?

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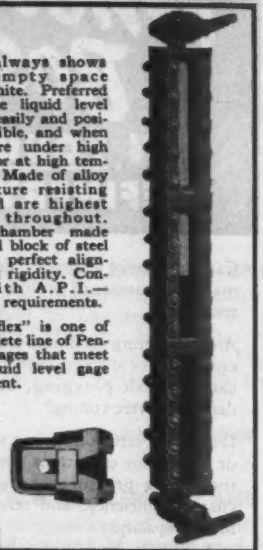

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was announced October 3 by War Assets Administration in Washington.

The plant, which is adjacent to Continental's Ponca City refinery, was operated by the company during the war. Built at a cost of $16,700,000, facilities include a 20,000-bbl. daily Thermofor catalytic cracking unit. A toluene plant also operated by Continental in Ponca City during the war has been declared surplus but not sold.

Athabaska Plant Tests To Start Next Spring

Following an inspection trip to the scene of the Alberta Government's bituminous-sand development near McMurray, Alta., in the Athabaska district 250 miles northeast of Edmonton, W. A. Fallow, minister of public works for Alberta, reported that actual test flows of oil at the government's experimental plant at Bitumont will start next spring. All equipment and material for completion of the plant is now on the ground.

Sinclair Butadiene Plant Shut Down

Butadiene production at the Sinclair Rubber, Inc., plant in Houston was shut down October 2, and employes were taking inventory preparatory to handing the plant back to the Government, Sinclair officials said.

A government order, issued August 20, instructed the plant to be closed within 90 days. Still in operation is a boiler unit which supplies steam to the Goodyear synthetic rubber plant nearby.

New Facilities Being Built By Daugherty Refinery

Details of an extensive new construction program that will include plant facilities for a recently developed product called "hydronate" were announced in Petrolia, Pa., October 5 by Daugherty Refinery, a division of L. Sonneborn Sons, Inc.

The hydronate plant will produce a petroleum sulfonate which is soluble in water, a product that will have extensive applications in the manufacture of detergents. Developed in the Daugherty Refinery research laboratories, hydronate will be sold only to industrial users for further processing into finished products, according to Sonneborn officials.

Among the other new facilities which will be in operation in early November is a 50-ton sulfuric-acid plant. This plant will increase the refinery's production of sulfuric acid to 100 tons per day, according to Dr. F. W. Breth, vice president in charge of manufacturing, who said that the cutput will be devoted exclusively to processing petroleum specialties at the Daugherty Refinery.

Petroleum Equipment Buys Alkylation Facilities

Petroleum Equipment, Inc., has announced the acquisition of the Reconstruction Finance Corporation-owned alkylate facilities located at the Champlin refinery, Enid, Okla.

The government cost of the equipment and material in the plant approximated $3,800,000. Petroleum Equipment, Inc., plans to start crews on the dismantling work about October 10. A complete inventory will be published in booklet form and will be available to those interested.

List of Azeotropes Published

The most exhaustive list of azeotropes and nonazeotropes available has been published by the American Chemical Society in its August 1947 analytical edition of Industrial and Engineering Chemistry.

Two tables give compositions and boiling points of nearly 6,500 binary and ternary systems, most of which are azeotropic in properties. Table 1 shows binary systems and includes nearly 6,200 combinations of organic and inorganic mixtures, the great majority of which distill azeotropically. Table 2 shows more than 300 ternary or three-component systems.

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NATURAL GAS

Gas Flaring Halted In Old Ocean Field

FLARING of gas in Old Ocean field, Brazoria County, Texas Gulf Coast, has been eliminated completely, Ernest O. Thompson, chairman of the Texas Railroad Commission, has announced.

Elimination of the flare gas followed issuance of an order last month by the commission directing that all waste from gas flares on oil wells be stopped by October 1.

Thompson said that he has been notified that gas from all producing wells is now flowing into processing plants and that lines have been completed from all but three wells. These have been shut in.

Thompson said that about 40 miles of 3 and 4-in. pipe had to be laid to comply with the order. He congratulated operators in the field for their quick action.

"The time will come when all such flaring in Texas will be halted," he commented.

August Gas Sales Show 9.2 Per Cent Gain

Natural-gas sales in August totaled 1,779,852,000 therms, an increase of 9.2 per cent over August 1946, according to the monthly report of the American Gas Association.

The index of natural-gas sales for August stood at 199.5 per cent of the 1935-1939 average. During the 12 months ending August 31, total sales of natural gas were 24,706,764,000 therms, a gain of 11 per cent over the like period a year ago.

Total sales of all types of utility gas to ultimate consumers in August were 1,983,820,000 therms, a gain of 8.2 per cent over the comparable month in 1946, A.G.A. reported. The August index of total gas utility sales stood at 193.5 per cent of the 1935-1939 average. One therm equals about 95 cu. ft. of natural gas.

Kansas Company Studies Gas by Vein-Fired Coal

Production of gas by firing coal in the original vein is proposed by Kansas Industrial Development Corp., Inc., newly organized at Lawrence, Kans. The method, being developed by Lawrence chemists, will permit the use of coal now considered impractical to mine because of its poor quality and prohibitive excavation costs.

Coal would be fired under pressure and in the presence of water, Rep. Charles D. Stough, Lawrence attorney, resident agent, and one of the incorporators, said. He indicated that the gas so produced would be bottled for sale in other areas of the country where natural gas is not readily available.

Other incorporators are Mary Jule Stough, Lester L. Henry, and Mrs. L. L. Henry, all of Lawrence. Offices are in the Jayhawker Building, Lawrence.

Texas Sets October Sweet-Gas Allowables

The Texas Railroad Commission has set the October sweet natural-gas allowables for Texas fields as follows:

Alief, 6,000,000 cu. ft. daily; Blue Lake, 4,000,000; Needville, 13,000,000; North Louise, 5,719,355; Old Ocean, 215,537,000; La Blanca, 9,032,258; McAllen, 17,741,935; Riverside, 3,064,517; Rooke, 14,252,419; South Weslaco, 29,000,000; Carthage, 385,550,323; Navarro Crossing, 6,579,289; Oakwood, 3,906,129; Rodessa, 22,007,613; Waskom, 28,843,935; Whelan, 60,092,339; Sipe Springs (high pressure), 1,869,097; and Eden, 2,064,516.

Pittsburgh Gas Companies Restricting New Service

Manufacturers Light & Gas Co. and Peoples Natural Gas Co., Pittsburgh, in view of expectations of another shortage of natural gas this winter in the Appalachian area, have announced that they will refuse to approve applications for new central heating equipment designed to use gas.

In addition to the new restrictions placed in effect by the two Pittsburgh companies, it is expected that all gas companies in the area will again make drastic cuts this year to industrial customers. The restrictions make exception to completed installations or where the applicant has entered into a contract for gas equipment in new construction.

In Charleston, W. Va., the president and general manager of the United Fuel Gas Co. said that the construction of three propane plants at Kenova, W. Va., is expected to alleviate but not eliminate the prospective shortage of natural gas in the Appalachian area. He emphasized the situation is not due to lack of natural resources but rather the scarcity of essential materials.

FPC Report Shows Gain In Gas Revenue, Sales

WASHINGTON.—Operating revenues of natural-gas companies reporting to the Federal Power Commission amounted to $40,932,488 in July 1947, an increase of 10.8 per cent over the $36,943,349 reported for the same month a year ago.

Gas sales to ultimate consumers in July 1947 were up 9.1 per cent over July 1946. Revenues from such sales increased 12 per cent and amounted to $20,101,267. Sales to residential consumers increased 10.2 per cent while those to commercial and industrial consumers increased 16.4 per cent and 8.5 per cent, respectively. Revenues from these three consumer groups were: residential, $7,190,351; commercial, $1,392,873; and industrial $11,069,069, up 9.9 per cent, 16.1 per cent, and 11.8 per cent, respectively.

Northern Natural Gas Hearing Postponed

WASHINGTON.—The Federal Power Commission has, at the company's request, postponed a hearing scheduled for October 13 in Washington on an application filed by Northern Natural Gas Co. to construct and operate facilities to increase its system capacity to 580,000,000 cu. ft. a day. The FPC order said a date for hearing will not be set until Northern Natural files a supplement to its application, and notifies the commission of its ability and intention to proceed with plans under the application.

Association to Meet

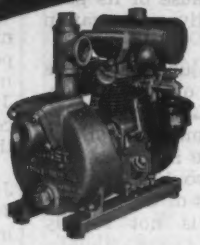
The Southern California Meter Association has scheduled a meeting for October 16 at the Rio Hondo Country Club. The program includes discussions of metering at the Hyperion activated sludge plant being built for the city of Los Angeles and a description of the world's largest clorination equipment unit.

Myers Heads Conference

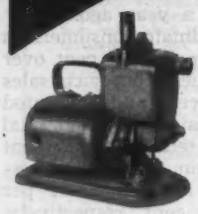
Vernon Myers, assistant to the president of Sioux City Gas & Electric Co., was elected chairman of the America Gas Association's Midwest Personnel Conference which discussed employe training and relations at its meeting in Colorado Springs, Colo., September 12.

It costs LESS to do the job BETTER

WITH A GORMAN-RUPP PUMP



THE MIDGET 2101--3000 GPH at 20 foot total head, and 5 foot suction lift.



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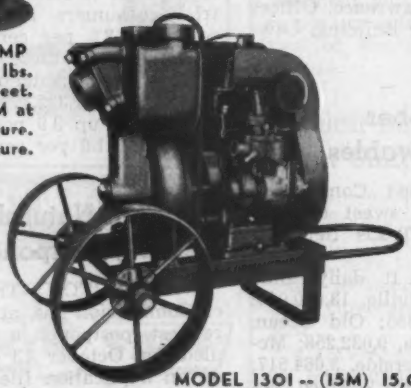

MODEL 1301 -- (15M) 15,000 GPH at 20 foot total head, and 10 foot suction lift.

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For size, for weight, for power, for dollar of investment -- by any comparison -- Gorman-Rupp self-priming, centrifugal pumps will put out more gallons per hour than any pump on the market and give you highest efficiency. In saving of time alone they have repeatedly repaid their cost to the many users in the petroleum industry.

These pumps are built for years of hard service. Five years without repair are frequently reported. Three months continuous runs without shut-downs are not uncommon with the Gorman-Rupp. The greater priming simplicity pays off in more work for less fuel and power. They are simple and rugged. They are streamlined inside and will not clog: any muck or solids that will pass the intake screen will clear through the pump.

Gorman-Rupp centrifugal pumps are made in any size or capacity up to 125,000 gallons per hour. Try a Gorman-Rupp pump on your next job. You will find it the most efficient and trouble-free pump you can buy. Every Gorman-Rupp pump is sold on a money back guarantee.

Further information upon request.

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PIPE LINES

Gulf Lets Contracts For Looping Project

Gulf Refining Co., Tulsa pipe line division, has contracted 48 miles of 10-in. for five loops in the area between Centralia, Ill., and Dublin, Ind. When the work is finished the company will have two complete 10-in. lines, since the new looping will fill in gaps between previous loops.

Sheehan Pipe Line Construction Co. will lay 40 miles; T. & L. Construction Co. will lay 8 miles. Work started early this week.

Cities Service Gas Laying Guthrie-Drumright Line

Cities Service Gas Co. is laying a 47-mile line between Guthrie and Drumright, Okla., consisting of 15 miles of 16-in. and 32 miles of 12-in. The west end has been contracted by Permian Construction Co.,; the east end by Albert Johnson Excavation Co.

In connection with the undertaking 100 miles of pipe is being removed from the Drumright-Fittstown line. Approximately 50 miles of this is 16-in. pipe being removed by contract with Deaton & Sons; 50 miles of 12-in. takeup has been contracted by H. C. Millar Construction Co. Double-jointing operations are carried on at a yard near Stroud, Okla., where Crose expanders are used to hold pipe in a round shape while beveling.

Texas Pipe Line Contracts For Station Near Hearne

Texas Pipe Line Co. has awarded contract to Brown-Lane Co., Borger, Tex., for the erection of a pump station 1½ miles southeast of Hearne, Tex., on the Beaumont-Dallas products pipe line.

Laying of pipe and erection of tankage on Texas Pipe Line Co.'s part of the line between Hearne and Dallas is under way, and completion is expected by February 1. Completion of the extension from Hearne to Austin and from Dallas to Fort Worth is expected by May 1.

Ottawa-Joliet Project 40 Per Cent Completed

Midwestern Constructors, Inc., has completed about 40 per cent of a 52½-mile, 24-in. looping project between Ottawa, Ill., and Joliet, Ill., for Natural Gas Pipe Line Co. of America.

The job, begun early in September, is expected to be finished about November 1. Three small river cross-

Left photo shows beveling with internal expander in Cities Service Gas Co.'s double-jointing yard near Stroud, Okla. A scene at the yard is shown below

CRC

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Pipe Line Equipment and Materials
Houston-Tulsa

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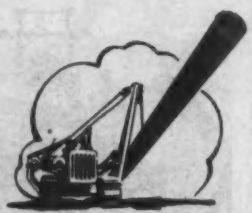
In the pipe line construction business, Oklahoma Contracting Co., Inc., gets the oil industry's OK of approval. For almost 30 years "OK" jobs all over the world have given us an enviable reputation. On that next pipe line job of yours get an "OK."



OKLAHOMA
CONTRACTING CO., INC.
MERCANTILE BANK BUILDING
DALLAS 1, TEXAS

ings are involved. The contractor is employing one river-crossing gang and one main-line spread. R. C. Stanely is superintendent in charge with headquarters in Ottawa.

Another Midwestern project, 19 miles of 24 in. from Joliet to Chicago for Chicago District Pipe Line Co., also is expected to be completed about November 1.

Field Survey Made on Mississippi-Mobile Line

A field survey for the construction of an 18-in. natural-gas pipe line from Baxterville field in Mississippi to Mobile, Ala., has been completed by United Gas Pipe Line Co., Shreveport.

Some rights-of-way have been purchased but Federal Power Commission approval is awaited before beginning construction.

Smith Contracting to Take Resistance-Welding Jobs

Smith Contracting Co. will be ready to take contracts for constructing pipe lines of any diameter with application of electric-resistance welding, according to an announcement by O. R. Smith, president.

Equipment for this process, the first of its kind to be used on a pipe-line right-of-way includes special hydraulic clamps. Welding will be done by a conventional pipe-line welding unit with special magnetic storage field equipment developed by O. R. Smith Manufacturing Co. Gross weight of such self-propelled welding unit will be 40,000 lb.

Smith Contracting Co. also will offer in January to give bonded guarantee for maintenance of coated and wrapped lines for 20 or 30 years operation.

300 Miles Laid on Corsicana-Patoka Line

More than 300 miles have now been laid on the 20-in. crude-oil pipe line being built from Corsicana, Tex., to Patoka, Ill., by Magnolia Pipe Line Co.

In another project, only 9 miles remained to be laid October 6 on the products pipe line of Magnolia between Beaumont and Hearne, Tex. The 9 miles is west of Plantersville, Tex.

Scurlock Builds Facilities To Buy Bloomington Oil

Scurlock Oil Co., Houston, has become a crude-oil purchaser in Bloomington field, Victoria County, Texas, and is erecting storage facilities and a

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DROP FORGED STEEL
LIQUID LEVEL GAGES

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.
This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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Everything for the Construction and Maintenance of pipe lines

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Tulsa, Oklahoma

10-car loading rack on the Missouri-Pacific siding at Bloomington to ship by tank car.

Scurlock has only recently completed its 6-in., 30-mile pipe line from Jamison field, Coke County, West Texas, to Colorado City, Mitchell County. From Colorado City oil will be shipped northward from a 10-car rack on the Texas-Pacific Railroad.

Sun Oil Co., with seven producers, is the only operator in the Jamison field. Barnsdall Pipe Line Co. also serves Bloomington field.

T.G.T. Now Operating FM Radio Equipment

Tennessee Gas Transmission Co., Houston, now has in operation radio receiving and sending sets—on the eastern end of the company line. The company also is in the process of installing this equipment in other areas to facilitate and expedite pipeline working conditions.

Towers have already been erected for the fixed stations at Campbellsville and Winchester, Ky., and 12 mobile sets have been installed in pipe-line foremen's cars and in pipeline trucks. The 300-ft. towers are necessary to overcome the short range of FM equipment. Signals may be relayed from one station to the next.

Eventually every compressor station of the company is to be equipped with a fixed station, one at the Agua Dulce dehydration plant, and possibly one at the end of the San Salvador line in Hidalgo County, Texas. The fixed stations at Burnaugh and Broad Run, W. Va., are to be constructed soon.

The radio system will not replace the leased telephone line, because under present conditions a station at one end of the line cannot talk to one at the other end unless the message is relayed. However, automatic relays to do this job are now in the process of development.

O. C. Whitaker Gets Stanolind Contract

Contract for construction of Stanolind Pipe Line Co.'s 74.4-mile 20-in. looping line between the Mississippi River and La Plata, Mo., has been awarded to O. C. Whitaker Co. Construction is to begin October 15.

Kansas Crude Runs Show Slight Drop

Pipe-line runs of Kansas crude oil averaged 288,223 bbl. daily for the week ended September 29, a decrease of 10,554 bbl. daily from the previous week's average, it was reported by the Kansas Conservation Division.

Kansas crude-oil production for the week ended September 27 was 298,800 bbl. daily which was a slight increase over the previous week's production of 298,050 bbl. daily.

FPC Hearing Set

WASHINGTON.—The Federal Power Commission has set a hearing October 20 in Washington on an application filed by Alabama-Tennessee Natural Gas Co. to construct facilities to make natural gas available to the Reynolds Metal Co. at Listerhill, Ala.; Tennessee Valley Authority at Muscle Shoals, Ala., and the National Utlities Company which sells manufactured gas in Florence, Sheffield and Tuscumbia, Ala.

Account Rules Published

WASHINGTON.—Complete rules for the uniform system of accounts for oil pipe-line companies have been published in the Federal Register by the Interstate Commerce Commission. These rules were substantially revised in November 1942 but were not published, and the ICC has now discovered that the Administrative Procedure Act requires that they be published as a part of the Code of Federal Regulations. They occupy 24 pages in the Federal Register of October 3.

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45 WELLS REWORKED
45 SUCCESSFUL PLUG-BACKS
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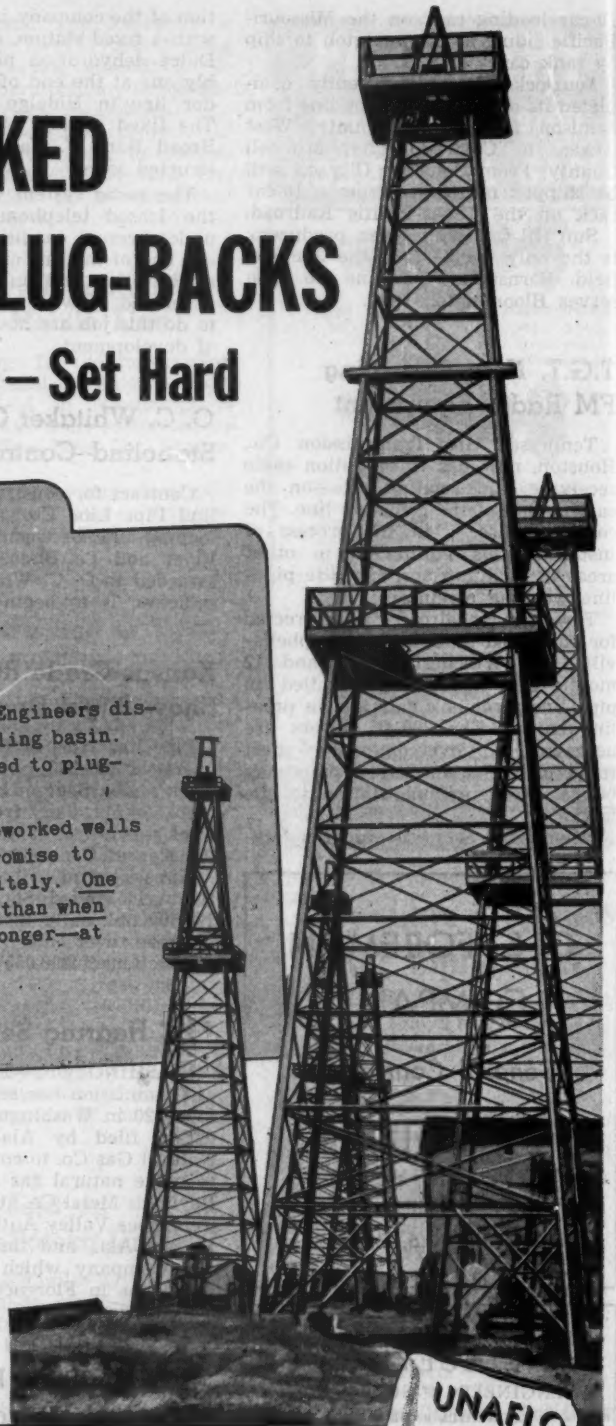
UNAFLO FILE FACTS:

Texas Development.

Problem: Salt water showing in some wells. Engineers discarded ideas for building large lake as settling basin. Discarded plans for pipe-line to sea. Decided to plug-back with Unaflo.

Every one of 45 jobs proved successful. Reworked wells show only a small decrease in production—promise to continue producing high-gravity oil indefinitely. One well actually made more oil after cementing than when it was drilled in. All wells will produce longer—at lower cost.



WHETHER it's for cementing casings, squeezes or plug-backs, Unaflo gives you exactly what you need. It does not stiffen prematurely. Its retarded set keeps it fluid and pumpable under high temperatures, pressures and unforeseen delays. After the period of retardation, it sets normally to provide a hard, dense seal.

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Resistant to Sulfate Waters

Atlas Portland Cement—Type I

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Resistant to Sulfate Waters

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"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—September to June—ABC Network*

Exploration and Drilling

Mississippi Has Important New Pay

PRACTICALLY every deep-seated salt-dome structure in the Mississippi salt-dome basin is wide open for new testing in the Glen Rose lime as a result of the performance of Gulf Refining Co. 1 L. L. Majors, 29-6n-11w, Jones County, about 30 miles southwest of Eucutta field.

On drill-stem test from perforations at 12,880-904 ft., 12,931-27 ft., and 12,938-51 ft. in the lower Glen Rose, the well made 112 bbl. of 42°-gravity oil in 8 hours, with ¼-in. top and ⅜-in. bottom chokes, flowing pressure 700 psi., gas-oil ratio 1,258 cu. ft. With a 3/16-in. top choke instead of the ¼-in., the well made 110 bbl. in 9¾ hours, flowing pressure 1,000 psi., gas-oil ratio 1,173 cu. ft. Bottom-hole flowing pressure was 4,135 psi.

A test higher up the hole then flowed at the rate of 133 bbl. daily of 30°-gravity oil. In its earlier stages of drilling the well had a recovery of 30 ft. of 10°-gravity oil from probably the Eutaw sand at 7,305-38 ft.

Tops Reported

Tops reported are Eutaw 7,305 ft.; Tuscaloosa 7,345 ft.; Marine Tuscaloosa 8,233 ft.; Massive sand 8,727 ft.; top of anhydrite 12,711 ft.; base of anhydrite 12,848 ft.; first porosity (generally considered Rodessa pay) 12,883 ft.; total depth 13,851 ft.

Unofficial reports say that due to short-term leases in the vicinity, the operator will try to make a commercial producer in one of the shallower sands, and concentrate on drilling to that pay to hold leases about to expire, then go on down to test deep Glen Rose pays later.

Very few of the deep-seated salt domes have been tested this deep, therefore with high-gravity oil, a new play is likely to sweep over all the known deep-seated domes that have been condemned in the Massive or Eutaw, where leases have been allowed to expire.

Farther west, in Franklin County, J. C. Hawkins and Graham Drilling Co. 1 Lehman Brothers, in 27-7n-2e, east of Cranfield field, appears to have some oil in the top 18 ft. of the Massive sand at 10,542-558 ft., but whether a commercial producer can be completed remains to be seen. Unofficial rumors are that the seismograph picture of one of the major companies shows a high to the north of the present well.

If true, and the well-developed Massive sand continues up structure, with oil saturation in proportion to structural position, the present well may lead to opening up of a good field farther north.

ROCKY MOUNTAIN

East Antelope Well Is Plugged Back for Tests

DENVER. — Continental Oil Co. - General Petroleum Corp. 1 Unit, NW SW SE 26-27n-93w, East Antelope area, Fremont County, Wyoming, stopped drilling at 6,611 ft. in the top of the Steele shale (Upper Cretaceous) and began plugging back to test upper horizons. A drill-stem test at 6,450-6,530 ft. failed to reveal any shows. The 7-in. was cemented at 2,300 ft., and was perforated at 2,157-80 ft., where it showed for esimated 22,000,000 cu. ft. of gas per day. After a squeeze job, it was perforated at 2,015-80 ft., and recovered water. It will test at 1,360-66 ft. where it showed for 15,000,000 to 20,000,000 cu. ft. of gas in a Teritiary lense formation. This appeared at the time to be a gas pocket, but gas showed in a water well 300 ft. away. The gas was methane and inflammable.

This is one of a series of recent tests in Fremont and Sweetwater counties lying to the west of Lost Soldier and Wertz fields, and 7 to 15 miles south of the Crook's Gap field. The first of the current series was drilled by Continental 3 miles to the southeast in 1944 in 1 Christiana on the Barren Butte structure. It was abandoned at 4,875 ft. General Petroleum next drilled 45-25-G on the Antelope Plains structure 5 miles to the west to 10,776 ft., where it was abandoned after finding water in the Frontier, Dakota, Lakota and Nugget sands. Carter Oil Co. next drilled 1 Government on the Great Divide structure 3½ miles to the south of the present test, and abandoned it at 8,551 ft., having had the top of the Steele at 8,215 ft. The four structures tested are unitized and comprise more than 50,000 acres.

Elk Springs.—Continental Oil Co. 2 Margaret Smith, SW NW SE 30-5n-98w, Elk Springs area, Moffat County, Colorado, topped the Weber sand at 6,253 ft., and drilled to 6,277 ft., where it stopped to run the 7-in. The location is ⅛ mile northeast of 1 Smith, a discovery in the Weber last year, which pumped an average of 85 bbl. a day and indicated a small structure with a very limited producing area. Testing will start as soon as cement sets on the casing.

Show in Tensleep at Hatfield. — Rocky Mountain Gas Co. 1 Government, NE SE NW 2-19n88w, Hatfield area, Carbon County, Montana, an old gas well completed in the Muddy sand at 3,850-91 ft. in 1931, is being deepened to test the Tensleep, which has never been drilled in this field. It had the top of the Tensleep at 5,805 ft., and was drilled to 6,072 ft., with the 4½-in. at 5,816 ft. A drill-stem test at 5,825-5,925 ft., open 2 hours, recovered 90 ft. of 43.2-gravity oil and 270 ft. of mud. The best saturation appears to be in the top of the sand, with only fair saturation at 5,844-5,969 ft. It is preparing to test.

Gas show in Utah wildcat.—Pacific Western Oil Corp. 1 Unit, C SE NE 24-14s-7e, Gordon Creek, Carbon County, Utah, is fishing at 12,060 ft. after having a good gas show in the Coconino formation of Permian age. A drill-stem test at 11,650-12,060 ft. was estimated at 10,000,000 cu. ft. of gas per day at the end of 40 minutes when the packer failed. The packer was reported leaking during the test. There was a recovery of 500 ft. of black, gas-cut mud with sulfur odor, although the gas is believed to be predominently carbon dioxide. Top of Coconino was at 11,568 ft., elevation 7,700 ft. ground. The test holds the Utah record for drilling depth.

Mush Creek.—Phillips Petroleum Co. 1 Torgeson, C NW SE 7-44n-63w, Much Creek, Weston County, Wyoming, 1¼ miles west of Morton Drilling Co. 1 Johnson, which flowed 1,740 bbl. in 24 hours, which is expected to mark an important extension, is cleaning out with cable tools at 4,335 ft., total depth, after setting 5½-in. at 4,254 ft. and moving out rotary tools. Operator will clean out to bottom before swabbing mud load. Superior Oil Co. of California has closed a deal with Conejos Corp. for completing 1 Christiana, SE SW SE 32-45n-63w, 2 miles north of the Johnson well, which has been waiting for casing at shallow depth. Contract has been let to Frontier Drilling Co. It is the next key well to show production trend.

Elk Basin Madison test.—Stanolind Oil & Gas Co. 95-M, NE NW SE 31-58n-99w, Elk Basin field, 2 miles south of the Madison discovery, is testing upper section of that horizon. It perforated at 5,066-5,230 ft. with 252 shots. The 5-in. retainer was set at 5,035 ft. It flowed 64 bbl. per hour with 2.2 per cent water. After acidizing with 2,000 gal., it flowed 85 bbl. per hour, 2 per cent water. It is drilling out retainer at 5,385 ft.

West Douglas Creek.—General Petroleum Corp. 1 Government, C NE SW 24-2s-103w, West Douglas Creek, south of Rangely field, Colorado, in a drill-stem test at 5,518-42 ft., open 40 minutes, recovered 46 ft. of salt water, no oil or gas.

New operations.—Twenty-three new operations were reported, of which 8 were in Colorado, 8 in Wyoming, and 7 in Montana. These include 2 wildcats in Wyoming and 2 in Montana.

COLORADO SUCCESSFUL WILDCAT

Ridgway, Ouray County: American Petroleum Co. 2 Ashing, NE SE SW 11-45n-8w, TD 485 ft., est. 100,000 cu. ft. of gas in Mancos shale.

COLORADO WILDCAT FAILURE

Mancos, Montezuma County: Barney Cockburn 1 Redd-Summers, C NE SW 27-36n-12w, TD 990 ft., dry in Dakota, top, 800 ft.

MONTANA WILDCAT FAILURE

Warren, Carbon County: A. B. Chase 1 Brockway, NW SE NW 19-8s-25e, TD 2,080 ft., dry and abd. Embar 1,440, Tensleep 1,560, Madison 2,010 ft.

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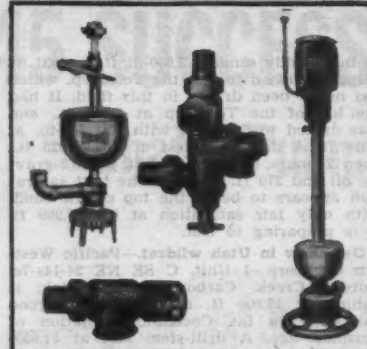
QUALITY
PRODUCTS



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All are of rugged construction and made by an organization with 59 years experience in the manufacture of highest quality products.

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HOUSTON, TEXAS NEW ORLEANS, LA.

SOUTHWEST TEXAS

Washburn Ranch Gets Extension

CORPUS CHRISTI.—A new oil discovery, 1 mile southeast of the east end of Washburn Ranch field, in La Salle County, Newman Brothers Drilling Co. and Skinner & Eddy Corp. 1-D South Texas Syndicate, flowed clean oil into the tanks from open hole at 5,248-53 ft. in the Wilcox zone, where drill-stem test had recovered 200 ft. of 45°-gravity oil and 35 ft. of mud in 30 minutes, with 30 psi. working pressure. The 5½-in. casing was set at 5,248 ft. Total depth is 5,253 ft. This well is located in the G. W. von Roeder Survey 60.

A new oil field in western McMullen County has been opened by Newman Brothers Drilling Co. and Skinner & Eddy Corp. 2-AA South Texas Syndicate, located in the J. Fitzpatrick Survey 14, and 2 miles northeast of the Green's Branch field. Drilled to a total depth of 2,297 ft., this well recovered 130 ft. of oil in 1 hour on drill-stem test at 2,293-97 ft. The 5½-in. casing was set at 2,293 ft., for open-hole completion at 2,293-97 ft. in the Queen City zone: Top of the Queen City sand was logged at 2,287 ft. Operators have installed pumping unit for completion.

Humble Oil & Refining Co. is running production test at 1 W. R. Nicholson, new wildcat discovery in Webb County, approximately 12 miles west-northwest of Lopez field and 13 miles north-northwest of Carolina-Texas field. Total depth is 5,816 ft., with 5½-in. casing on bottom. Drill-stem test through perforations at 5,572-81 ft. recovered 485 ft. of 35.5°-gravity oil in 20 minutes, with 30 ft. of oil-cut mud, through ¼-in. chokes top and bottom.

Coastal Refineries, Inc., and M. L. Massingill 1-A Garcia Land & Livestock Co., wildcat test in southwestern Hidalgo, was making approximately 75 bbl. of oil and 75 bbl. of salt water per day after three squeeze jobs were made in an attempt to shut off the water. Total depth is 5,368 ft., with 5½-in. casing set to 4,675 ft. This well is located approximately 6 miles north-northeast of Sullivan City, 5 miles northwest of Samfordyce, near the Starr County line, in Porcion 43.

The 32 new locations reported this week included 15 wildcat starts, 2 each in Duval and Williamson counties, and 1 each in Bastrop, Caldwell, Edwards, Guadalupe, Jim Wells, McMullen, Starr, Val Verde, Webb, Willacy and Zapata counties. Three of the 13 wildcat completions were successful, one gas-condensate pool and one new oil pay in Squire pool, Duval County, and an extension to Blucher field in Jim Wells. The dry wildcats are two each in Duval, Jim Hogg counties, and one each in Kleberg, San Patricio, Starr, Webb, Williamson, and Zapata counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Duval County: New gas-condensate pool—Magnolia Petroleum Co. 1-A Drought, in J. L. Saens Survey 154, 13 mi. NW of Freer, 1 mi. NW of Charamousca field, top pay 6,545 ft., TD 8,504 ft., IP: 2,031,000 cu. ft. gas per day and 16 bbl. per day condensate through a 5/16-in. choke, or 5,400,000 cu. ft. gas per day on open flow, TP 1,161 psi., casing sealed, gravity 53.9°, straw-colored condensate, 4.8 bbl. per day water.

New oil pay, Squire pool: Santa Clara Oil Corp. and John F. Camp & Sons 4-C Jas. F. Welder Hrs., in M. G. Nunez Survey 4, 13 mi. NW of San Diego, top pay 3,826 ft., Yegua sand, TD 4,048 ft., perf. 3,830-38 ft., IP: 132 bbl. oil per day through 5/32-in. choke, gas-oil ratio 977, TP 285 psi., CP 900 psi., gravity 38°, no water.

Jim Wells County: Extension to Blucher field—Blanco Oil Co. and A. A. Buchanan 1 Conrad Blucher et al, in Mrs. L. Best Sur. 362-A, ¾ mi. NE of Blucher field, 7 mi. SE of Premont, dual completion, top pay 7,205 ft., TD 7,449 ft., perf. 7,205-08 ft., IP: 165 bbl. oil per day through ⅛-in. choke, gas-oil ratio 1,405, TP 1,600 psi., gravity 42.2°, top pay 7,440 ft., perf. 7,442-46 ft., IP: 166 bbl. oil per day through a ⅛-in. choke, gas-oil ratio 2,880, CP 2,250 psi., gravity 45.8°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Duval County: H. H. Howell 1-C Lizzie Singer, in SK&K Sur. 247, 5 mi. N of Benavides, dry, TD 6,543 ft.

H. H. Howell 1-E Humble Oil & Refg. Co. in T. Chapa Sur. 12, 3 mi. NE of Benavides, dry, TD 3,957 ft.

Jim Hogg County: Humble Oil & Refg. Co. 3 Nicefero Pena et ux, in Kelsey area, in Santa Teresa Grant, dry, TD 8,502 ft.

O. W. Killam 1 Downs Royalty Co., in El Javali Grant, 5 mi. SW of Cuevitas, dry, TD 3,222 ft.

Kleberg County: Southern Minerals Corp. 1 J. A. Hubert, in Mrs. H. M. King Subd. 3, 7 mi. SE of Ricardo, dry, TD 7,517 ft.

San Patricio County: Luling Oil & Gas Co. 1-A C. T. Morrow, in Geo. H. Paul's Subd. of Coleman-Fulton Pasture, 3 mi. SE of Odem, dry, TD 6,505 ft.

Starr County: Henry Etheredge 1 Green & Manning, Lot 4, Share 85, Porcion 81, 4½ mi. N-NE of Rio Grande City, dry, TD 1,396 ft.

Webb County: Stanley G. Marshall and Clyde C. Marshall 1 Transwestern Royalty Co. et al, Survey 684, 6 mi. NE of Oilton, dry, TD 2,399 ft.

Williamson County: B. P. Cavnar 1 Wm. Fuch, 3½ mi. SE of Thrall, in SE corner of county, in Hamilton Survey, dry, TD 1,375 ft.

Zapata County: E. A. Bowles 1 Anastacio Garcia, in Charco Redondo Grant, 15 mi. NE of Zapata, dry, TD 1,740 ft.

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MICHIGAN

Deepest Michigan Test Drilling Below 8,200 Ft.

SAGINAW.—The Ohio Oil Co.-Pure Oil Co. 1 Reinhardt deep test, scheduled to become Michigan's deepest search for oil, was drilling below 8,200 ft. A strong show of gas was encountered at 8,185 ft. The operation, intended for a possible maximum depth of 12,000 ft., is in Section 35 of West Branch Township, Ogemaw County.

Field operations for the week resulted in 21 completions, while 26 new locations were announced. Nine of the wells are oil producers with initial production ranging from 13 to 500 bbl. per day. One of seven wildcat completions was a producer, rating 20 bbl. a day after acid treatment. It is the T. F. Caldwell 1 McKenna in Section 4 of North Plains Township, Ionia County. The completions list included one other dry hole and five gas wells, four in Clare County, the other in Oceana. The 500-bbl. producer was the week's only completion in Kimball Lake field of Newaygo County. Other production was from one well in Allegan County, two in Arenac, two in Bay, one in Oceana and one in Montcalm.

New locations are in 13 counties, five in Bay, three in St. Clair, three in Allegan, two each in Van Buren, Oceana, Midland, Montcalm and Newaygo, one each in Ottawa, Lake, Lapeer, Gladwin, and Clinton.

MICHIGAN SUCCESSFUL WILDCAT

Ionia County, North Plains Township: T. F. Caldwell 1 Dr. W. F. McKenna, SW NW SE 4-8n-5w, pumping 20 bbl. after acidizing in Dundee formation, TD 3,038 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: Norman L. Stevens 1 Ralph Warfield, SE NW NE 36-1n-16w, dry in Traverse limestone, TD 1,159 ft.

Salem Township: Harry Stroud and Clyde B. Miller 1 Earl J. Lyon, SE SW NE 34-4n-13w, dry in Alpena, TD 1,713 ft.

Trowbridge Township: Joseph I. Rush 1 Leon Wood, NW SE NE 25-1n-13w, dry in Traverse limestone, TD 1,478 ft.

Genesee County, Montrose Township: J. O. Mutch 1 Marshall Smith, SE SE NE 19-9n-5e, dry in Detroit River, TD 2,736 ft.

Isabella County, Rolland Township: Teater & Comstock, Tr., 1 Orion Johnson, NW SE SW 28-13n-6w, dry in Detroit River, TD 3,636 ft.

Ottawa County, Robinson Township: Socony-Vacuum Oil Co., Inc., 1 Smeyer and Van Stratt, SE SE SW 26-7n-15w, dry in Traverse limestone, TD 1,750 ft.

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TEXAS GULF COAST

Oil Production Found in East Goose Creek Area

HOUSTON.—Oil production has been opened in the East Goose Creek gas area by Kirby Petroleum Co. 2 Kirby Petroleum Co. fee tract 20, located 933 ft. east of the discovery gasser. The well is in the C. Smith Survey, Abstract 22. Total depth is 6,442 ft., and 5½-in. casing is cemented to the bottom. Well is cleaning into pits on a small choke through perforations at 6,401-07 ft., flowing oil estimated at 38° gravity along with wash water and mud. Marginulina gas sands were picked up, also showing some condensate from 6,266-78 ft., and 6,320-32 ft. Oil sands in the Frio were found from 6,396-6,433 ft.

A new oil pool for Galveston County has been opened by John W. Mecom 8-A E. Ker Cade et al, off the northwest flank of the High Island dome. Located in the Isaac Lowrie Survey, 2,500 ft. from nearest production. Drilled to a total depth of 7,413 ft., with 7-in. pipe cemented 1 ft. off bottom, this well flowed a potential gage of 86.9 bbl. daily through perforations at 7,140-46 ft. A 12/64-in. choke was used, and flowing pressure on the tubing was 2,175 psi. Gravity of oil is 42° corrected and no water flow. Gas ratio is 2,300. Mecom has asked for discovery oil allowable rights for this well, and hearing has been set by the Texas Railroad Commission for October 23.

Union Producing Co. 70 G. A. Ray, outpost test approximately ½ mile northnortheast of the nearest oil production at Tulsita-Wilcox field, in Bee County, is running casing for production test. Total depth is 7,095 ft. Sand with oil shows was logged near the bottom of the hole. This well is located in George Kerr Survey.

The 39 new locations reported this week include 5 wildcat starts, 1 each in Brazoria, Chambers, Lee, Refugio, and Victoria counties. Wildcat completions show one oil field in Galveston County and one oil pay in Refugio County, and five dry holes, one each in Brazoria, Fayette, Jackson, Live Oak and Montgomery counties.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Galveston County: New oil discovery northwest flank High Island dome, John W. Mecom 8-A E. Ker Cade et al, in I. Lowrie Survey, 2,500 ft. northwest of production at High Island dome, TD 7,413 ft., top sand 7,125 ft., perf. 7,140-46 ft., IP: 87 bbl. oil per day through 12/64-in. choke, gas-oil ratio 2,300, TP 2,175 psi., 42° gravity, no water.

Refugio County: New oil pay (Refugio-Fox area)—La Gloria Corp. and Skelly Oil Co. 1-B Jamie Hynes, in Isabella O'Brion Survey, 3 mi. NW of Refugio, top pay 3,517 ft., TD 6,754 ft., perf. 3,517-25 ft., IP: 107 bbl. oil per day

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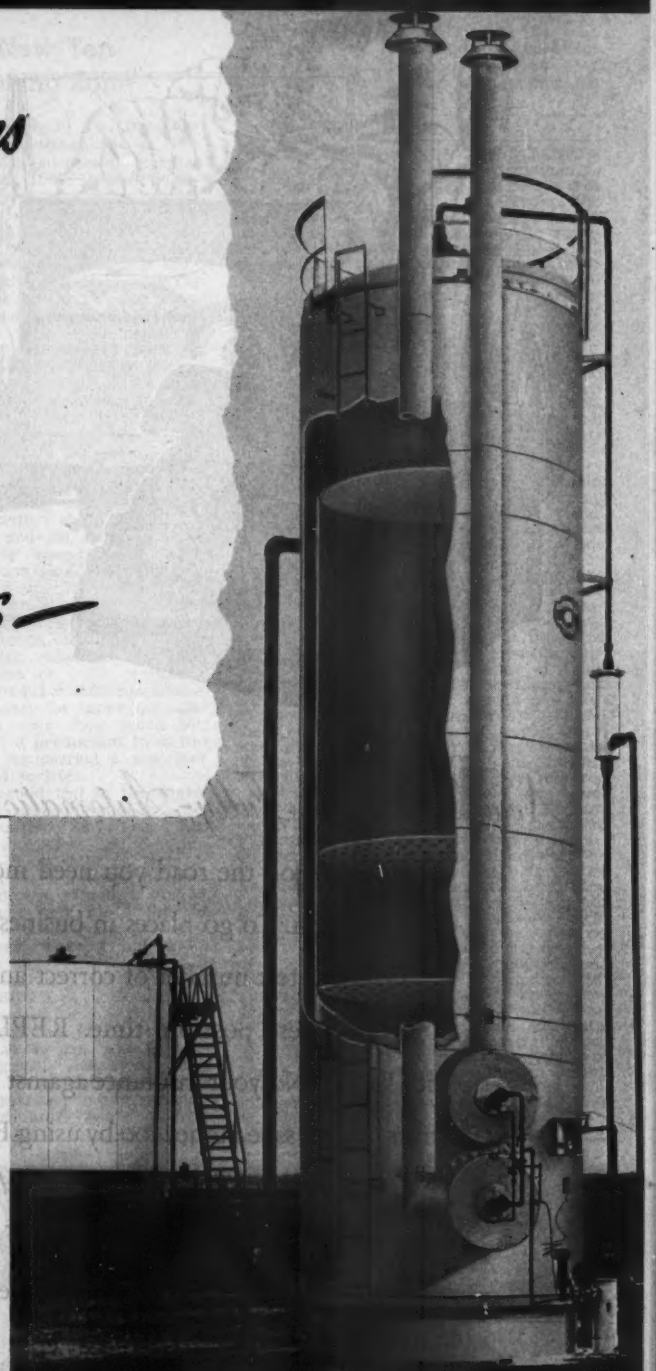

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through 5/32-in. choke, TP 55-80 psi., CP 220-240 psi., gravity 36.1°, no water.

TEXAS GULF COAST WILDCAT FAILURES

Brazoria County: Salt Dome Oil Corp. et al 1 R. L. Allison et al, Manvel southeast flank, in Thos. Spraggins Survey, dry, TD 4,458 ft.

Fayette County: Continental Oil Co. 1-A Tom Cockrell, in J. T. Whiteside Lge., ½ mi. W of Cistern townsite and on west side of Cistern shallow production, dry, TD 6,697 ft., top Reklaw 1,158 ft., Midway 4,308 ft., Navarro 5,063 ft.

Jackson County: T. J. Ahern 1 A. Michalčk, Jr., in C. W. Hahl Subd. of D. H. Burn Ranch, in J. J. Linn Survey, 5 mi. NW of Vanderbilt, dry, TD 4,875 ft.

Live Oak County: E. B. Clark 1 Josephine West McClelland, in Seth Carey Survey 36, 1 mi. E of Kittie, dry, TD 2,872 ft.

Montgomery County: W. T. Moran 1 C. I. Rawson, in Wm. Starrock Sur., NE of Conroe, dry, TD 5,017 ft.

SOUTH LOUISIANA

Bancroft Discovery Trying to Recomplete

NEW ORLEANS.—Vincent & Welch 1 Vincent & Welch and Houston Oil Co. fee, wildcat discovery in the Bancroft area, 1½ miles east of production in Bancroft field, Beauregard Parish, is attempting to recomplete through perforations level after squeezing. Testing level is from 8,082-84 ft. An initial completion attempt flowed 150 bbl. of fluid, gradually going to 95 per cent salt water, flowing through a 10/64-in. choke, pressure on tubing was 300 psi.

Phillips Petroleum Co. continues to test new deep gas sands in the 2 Onezime, 15-10s-1e, southeast of production in the Crowley field of Acadia Parish. This test is in the NE NW 15-10s-1e. Total depth is 11,940 ft., and 4½-in. liner has been set to 11,900 ft. Perforations are from 11,054-072 ft. A test through perforations at 2,520-25 ft. flowed at the rate of 1,500,000 cu. ft. of dry gas per day.

Stanolind Oil & Gas Co. is preparing to test a sand in the 7,000-ft. level in Florence area wildcat, Vermilion Parish. The well, 1 E. M. Watkins, 23-13s-1w, flowed dry gas with 1,200 psi. working pressure which dropped to 475 psi. at the end of 16 hours, through perforations at 9,285-90 ft. These perforations were squeezed and new perforations made at 7,070-73 ft. A squeeze job was made and a test for production is to be made.

Superior Oil Co. of California 2 State-LLE Unit 12, off the east side of the Four Isle dome, 24-21s-16e, Terrebonne Parish, flowed at the rate of 2,000,000 cu. ft. of gas with a slight amount of 57.4°-gravity condensate, with a flowing pressure of 2,200 psi. These perforations were squeezed. Operators have now perforated in the lower sands from 13,455-465 ft., set 2½-in. tubing at 13,383 ft. and are swabbing for completion. An initial test in the lower sand section from 13,467-475 ft. flowed at the rate of 135 bbl. of condensate per day along with 4,039,000 cu. ft. of gas per day through ¾-in. and 14/64-in. chokes. Gravity of condensate was 45.2° and gas ratio was 29,918.

There were 13 new locations reported this week, 2 of which are wildcats, 1 each in Assumption and St. Mary parishes. Two wildcat completions opened new sands, a gas-condensate sand in Vermilion Bay, Iberia Parish, and an oil sand in Plumb Bob field, St. Mary Parish. Two wildcats were dry, both in Rapides Parish.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Iberia Parish: New gas-condensate sand, Vermilion Bay—The Texas Co. 10-B

State-Vermilion Bay, Lease 334, in the bay, 15s-5e, TD 12,069 ft., perf. 9,840-56 ft., IP: 1,400,000 cu. ft. gas per day, no gage on condensate flow, shut in, TP 3,650 psi., SIP 4,000 psi., gravity 51.°, no water.

St. Martin Parish: New oil sand, Plumb Bob—The Texas Co. 6 St. Martin Parish School Board, 16-8s-7e, TD 9,200 ft., perf. 4,096-4,118 ft., IP: 8 bbl. oil per day through 16/64-in. choke, TP 50 psi., gravity 25.7°, 3 per cent water.

SOUTH LOUISIANA WILDCAT FAILURES

Rapides Parish: American Liberty Oil Co. 1 W. D. Haas, 4-1n-1e, 7 mi. NW of Cheneyville field production and 5 mi. SE of LeCompte townsite, dry, TD 7,226 ft.

W. T. Burton et al 1 J. A. Bentley Lbr. Co., 33-5n-1e, dry, TD 11,072 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that sealed bids will be received until 1 p.m., Wednesday, October 22, 1947, for land described herein situated within the known geologic structure of the Big Muddy field, 6th P. M., Wyoming. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat. 437, 30 U.S.C., sec. 181), as amended, in the following parcels: T. 33 N., R. 76 W., Parcel No. 1, sec. 17, SE¼SE¼, 40 acres. Parcel No. 2, sec. 18, lots 1, 2, E½NW¼, 158.72 acres. Parcel No. 3, sec. 18, N½NE¼, 80 acres. Parcel No. 4, sec. 20, E½NE¼, 80 acres. T. 33 N., R. 77 W., Parcel No. 5, sec. 12, SE¼NE¼, 40 acres. Parcel No. 6, sec. 12, SW¼, 160 acres. Parcel No. 7, sec. 13, NW¼, 160 acres. Parcel No. 8, sec. 13, NE¼, 160 acres. Total 878.72 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder, they may be included in a single lease, provided the combined acreage does not exceed 640 acres. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil and 12½ per cent to 16 2/3 per cent for gas in accordance with Schedule B in the lease form. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank, or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked "Bid for Parcel No. , Big Muddy field, Wyoming. Not to be opened before 1 p.m. Wednesday, October 22, 1947." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a corporate surety bond in the sum of $1,000 must be furnished by a successful bidder prior to the issuance of a lease. A $5,000 corporate surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

CALIFORNIA

Shell Opens New Ten Section Producing Zone

LOS ANGELES.—Shell Oil Co., Inc., has opened a new producing zone in Ten Section field with the successful completion of its 53-30 K. C. L.-A, located in 30-30s-26e. The well flowed at a gross rate of 794 bbl. of crude daily through a ½-in. choke. Net yield was 572 bbl. of oil, indicating a water cut of 28.0 per cent. Gas yield during the production test was 440,000 cu. ft., with tubing pressure varying between 200 and 350 psi. and casing pressure varying between 1,400 and 1,750 psi.

Originally carried to a total depth of 14,000 ft., the well was plugged back to 11,193 ft. when it was definitely determined that the lower portion of the hole was not capable of commercial production. Perforations were then made at intervals between 9,550 ft. and 10,765 ft., but the well yielded only 10 bbl. of oil and 20 bbl. of mud daily on swab. Operators then pulled the 7-in. casing from 9,505 ft. and set a bridge plug at 9,000 ft. Following perforating with 4 shots at 8,585 ft., 4 shots at 8,765 ft. and 160 shots at 8,820-60 ft., 2½-in. tubing was hung at 8,752 ft. and the well completed.

Producing interval in the 53-30 K. C. L.-A is just below the Stephens sand, the producing zone in other wells in the Ten Section field. Discovery of the new sand is considered highly significant at this time since production of wells completed in the field during recent months has shown an increasing tendency to taper off. Old wells in the area, once they reach the noncommercial rate of production from the Stephens, now can be carried a few feet deeper and restored to life.

Basin Oil Co.'s second test in the Inglewood area of Los Angeles County, the 2-1 Inglewood Community, 28-2s-14w, has topped an oil sand at 9,540 ft. and is coring ahead in the sand below 9,567 ft., according to latest reports. At this depth the sand is considerably higher on structure than it was in the discovery well, the 1 City of Inglewood, and indications to date are that the new venture will make a substantial producer.

Performance of Seaboard Oil Co.'s new well in the Bacon Hills area of Kern County so far has proved extremely encouraging. At last reports the well, the 24-21 Seaboard-Bandini, 21-28s-20e, was flowing 227 bbl. of 38.7°-gravity clean oil daily through a 18/64-in. choke. Tubing pressure was gaged at 300 psi. and casing pressure at 600 psi., but operators reported these were building up. This new well is the third for the field, discovered by Seaboard earlier this year, and so far shows indications of being the best of the three. It has uncovered more than 50 ft. of Oceanic oil sand in contrast to 13 ft. cored in the discovery well. Both the discovery and the second well failed as major producers, but results justified drilling of the present venture.

California completions during the past week totaled 40, and included 3 successful wildcats, 3 wildcat failures, and 34 field wells, 1 of which was dry. Wilmington led

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that sealed bids will be received until 1 p.m., Wednesday, October 29, 1947, for lands described herein situated within the known geologic structure of the Hugoton gas field, 6th P. M., Kansas, and C. M., Oklahoma. These lands are offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act of February 25, 1920 (41 Stat., 30 U.S.C., sec. 181), as amended, in the following parcels: Parcel No. 1, Holcomb area, Hugoton field, Kansas: T. 24 S., R. 34 W., sec. 32, S½, 320 acres. Parcel No. 2, Hugoton field, Oklahoma: T. 2 N., R. 18 E., sec. 4, SW¼SE¼, 40 acres. Total 360 acres. Annual rental will be at the rate of 25 cents per acre so long as the land is valuable only for gas; but upon discovery of a valuable deposit of oil within the boundaries of the known structure on which all or a part of these lands are situated, rental will be not less than $1.00 per acre. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil and 12½ per cent to 16 2/3 per cent for gas, in accordance with Schedule B in the lease form. Bids must be submitted on each parcel separately, but no objection will be made to the award of both parcels to the same successful bidder. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., and each bidder must submit with the bid one fifth of the amount bid in cash or by certified check on a solvent bank, or by money order, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.42(b) and (c). The envelopes should be plainly marked "Bid for Parcel No. , Hugoton gas field, Kansas and Oklahoma. Not to be opened before 1 p.m., October 29, 1947." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of 25 cents per acre must be paid, and a corporate surety bond in the sum of $1,000 must be furnished by a successful bidder prior to the issuance of a lease. A $5,000 corporate surety bond will be required prior to commencing drilling operations on the leased premises. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Director.

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in number of completions with six new wells and was followed by Kern River with three. Other field completions were distributed as follows: Coyote East, Cymric, Kettleman Hills, Lost Hills, Paloma, South Belridge, Cat Canyon, Santa Maria Valley and Midway-Sunset two each; Brea-Olinda, Coyote West, Huntington Beach, Kern Front, Padre Canyon and Ventura Avenue one each. The dry hole was in the Cymric field.

New locations staked during the week totaled 46, an increase of 3 over the previous week. Greatest activity was indicated for Wilmington, which received 7 of the projected ventures, Huntington Beach, which had 6, and West Newport, which received 4. The Cymric and Paloma areas each received two new locations, while the remainder were distributed throughout the state.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Cymric area: Independent Exploration Co. 22 Cymric, 21-29s-21e. flowed 360 bbl. per day through 13/64-in. choke, 1.5 cut, gravity 36.4°, perf. 4,870-4,900 ft., 7-in. set 4,942 ft., TD 4,990 ft.

McKittrick area: The Texas Co. 1 Westpet NCT, 29-30s-22e, flowed 296 bbl. in 16 hours, 12/64-in. choke, 0.5 cut, gravity 37.2°, perf. 4,400-28 ft., 7-in. casing 4,838 ft., TD 5,290 ft.

Los Angeles County, Athens area: Shell Oil Co., Inc. 1 Union-Poindexter, 12-3s-14w, pumped 175 bbl. in 14 hours, 35.0 cut, gravity 31.7°, TD 9,272 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, McDonald Anticline area: Signal Oil & Gas Co. 2 Signal-Honolulu-Carpenter, 6-28s-19e, dry in gray sand, elev. 1,752 ft., TD 2,215 ft.

San Emigdio area: Continental Oil Co. M-1 K. C. L., 27-11n-22w, dry, elev. 1,041 ft., Miocene shale 8,034 ft., Miocene sand 8,052 ft., top of fish 6,086 ft., TD 8,331 ft.

Ventura County, Adams Canyon area: Union Oil Co. 44 Adams, 20-4n-21w, dry, TD 1,770 ft.

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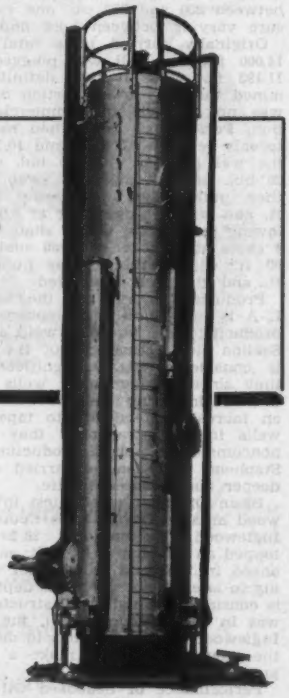

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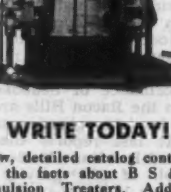

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APPALACHIAN FIELD

New Cork Farm Well Is Rated at 150 Bbl.

PITTSBURGH.—In Poca district, Kanawha County, West Virginia, Columbian Carbon Co. completed a second test on Donald L. Cork farm which flowed 100 bbl. of oil the first 16 hours and is rated as good for 150 bbl. a day, initial. Production is from the Big lime, total depth 1,700 ft.

In Portland district, Preston County, Snee & Eberly logged the Tully lime at 4,619-29 ft. in the test on Virginia Cuppett farm in the new gas pool area. This places that formation considerably higher on structure than in their good Onondaga chert wells on the Lewis and Sisler farms and faulting below is not incurred, the top of the Onondaga chert may be reached as high as 5,100 ft.

In Baileysville district, Wyoming County, Hope Natural Gas Co. continued its success on the New River & Pocahontas Consolidated Coal Co. tract with 9,138 which gaged 2,943,000 cu. ft. of gas from the lower part of the Maxton sand, total depth 1,986 ft.

In Clear Fork district, Raleigh County, Big Marsh Oil Co. completed 7 Rowland Land Co. good for 1,055,000 cu. ft. of gas from the Weir sand, total depth 3,118 ft.

In Wayne Township, Erie County, northwest Pennsylvania, Pennsylvania Gas Co. shut down at 4,591 ft. in the wildcat on John Kalika farm with 20,000 cu. ft. gas showing from the Medina (4,547-53 ft.) This company's test on the W. W. Stutzman farm is drilling at 4,175 ft.

In Richmond Township, Crawford County, Bean & White are moving in a standard rig to deepen the wildcat on Harry F. White farm from the Oriskany topped at 3,208 ft. into the Silurian. The surface elevation is 1,270 ft.

West Virginia new locations totaled 22 and in Scott district, Boone County; Sherman district, Calhoun County; Falls and Fayetteville district, Fayette County; Cabin Creek and Poca districts, Kanawha County; Skin Creek district, Lewis County; Harts Creek district, Lincoln County; Grant district, Marion County; Harvey district, Mingo County; Browns Creek district and Elkhorn district, McDowell County; Jefferson district, Pleasants County; Trap Hill district, Raleigh County; Grant district, Ritchie County; Grant and Union districts, Wayne County; Oceana and Slab Fork districts, Wyoming County.

WEST VIRGINIA SUCCESSFUL WILDCATS

Ritchie County, Clay district: Shale Oil Co. 1 George Mihlbaugh, 8 bbl., Injun sand, TD 1,889 ft.

Wyoming County, Baileysville district: Hope Natural Gas Co. 9,113 Julia W. Jennings, 1,953,000 cu. ft. gas, Maxton sand 2,220 ft., Big lime 2,465 ft., Berea 3,535-64 ft., not shot, TD 3,565 ft.

WEST VIRGINIA WILDCAT FAILURES

Kanawha County, Cabin Creek district: West Virginia Gas Corp. 546 Eastern Gas & Fuel Associates, dry, elev. 785 ft., Corniferous lime 5,523 ft., Oriskany 5,609 ft., TD 5,694 ft.

Lewis County, Hackers Creek district: Hope Natural Gas Co. 6,147 Francis Taylor, dry, through Benson horizon, TD 4,520 ft.

Putnam County: Union district: Godfrey L. Cabot, Inc. 1,247 Putnam Co., dry, elev. 674 ft., Corniferous lime 4,685 ft., Oriskany 4,805-36 ft., TD 4,843 ft.

Union district: Godfrey L. Cabot, Inc., 1,249 J. L. McLean Hrs., dry, elev. 954 ft., Corniferous lime 4,945 ft., Oriskany 5,036-72 ft., TD 5,075 ft.

Wyoming County: Baileysville district: Godfrey L. Cabot, Inc., 1,241 Nina Cook,

dry, Big lime 2,496 ft., Injun 2,876 ft., Berea 3,460-3,500 ft., shot 3,475-95 ft., TD 3,503 ft.

N. CENTRAL TEXAS

Montague Wildcat Is Possible Discovery

WICHITA FALLS.—R. C. Lipscomb 1 McCall, Block 132, J. H. Belcher Survey, a wildcat 3 miles south of Belcherville in Montague County, was showing for a possible Strawn sand discovery. On a drill-stem test at 4,856-63 ft., 25 ft. of free oil and 50 ft. of oil-cut drilling mud was recovered. Operators planned to drill ahead. Nearest production is the Sanders Bend conglomerate field, 2 miles to the east.

Fred M. Manning, Inc., reported a gas-development program, for possible future repressure or gas-lift purposes in Parrott field of southeastern Throckmorton County. Two wells, the 1-B Marshall, Block 949, TE&L Survey, and the 2 Parrott-Goodloe, Block 955 of the same survey, are to be completed in a gas sand around 1,200 ft. This area is one of the most active spots of North Central Texas.

One of the largest oil wells to be brought in in North Texas was reported at Consolidated Oil Co. 8 Jones-Payne, 6½ miles southwest of Wichita Falls, in the Taylor Corner field. When the plug was drilled, on 40 ft. of saturated sand between 4,182-4,222 ft., the well started flowing at the rate of 100 bbl. of oil an hour through 7-in. casing. Consolidated officials said the well flowed for several hours and had made a potential of 800 bbl. a day, with daily production expected to be around 500 bbl. a day.

Extended Ellenburger production, or a new pool, was reported for western Stephens County at Prairie Oil & Gas Co. of Texas 1-B Henry Compton, Section 12, OAL Survey, 16 miles southwest of Breckenridge and 1 mile south of Wild (Ellenburger) field. The pay zone was found at 4,311-48 ft., but the amount of flow before being shut in for storage was not estimated.

Four miles southeast of Ringgold in Montague County, Continental Oil Co. 1 Hawkins, swabbed 66 bbl. of water having a light show of oil, from perforations in conglomerate at 5,752-57 ft. Fluid level was 5,000 ft. from the surface after 16 hours of swabbing.

North Texas locations for the week totaled 42. By counties, they are: Archer 11, Clay 5, Cooke 7, Jack 3, King 1, Throckmorton 2, Wichita 5, Wilbarger 2, and Young 6. Oil well field completions, by county, were: Archer 1, Clay 3, Jack 4, King 1, Montague 2, Wichita 2, Wilbarger 3.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Haskell County: T. D. Humphrey 4 E. H. Burnett, Subd. 2, Blk. 58, J. Campbell Sur., A-91, 8 mi. NE Haskell, pumped 63 bbl. 39.9°-gravity oil a day plus 20 bbl. water, top Canyon Reef 2,775 ft., TD 2,778 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Carl Childs 1 J. H. Roberson, Blk. 8, J. Lewellyn Sur., A-256, 14 mi. W Archer City, dry, TD 1,460 ft.

The Texas Co. 1 Sallie B. Dycus, Sec. 1879, TE&L Sur., 7 mi. S Windthorst, dry, TD 1,035 ft.

Brown County: Alph Tillman 1 V. D. Cavel, Sec. 16, HT&B Sur., 2½ mi. SE Thrifty, dry, TD 1,676 ft., Caddo limestone 1,659 ft., slight show of oil.

Cooke County: Continental Oil Co. 1 C. P. Strader, H Nail Sur., A-790, 1½ mi. NW Era, dry, TD 1,736 ft., Ellenburger 1,475 ft., show dead oil 1,478-82 ft.

Edelen & Noel 1 R. R. Kirby, H. Nail Sur., A-790, 4 mi. NW Era, dry, TD 1,346 ft.

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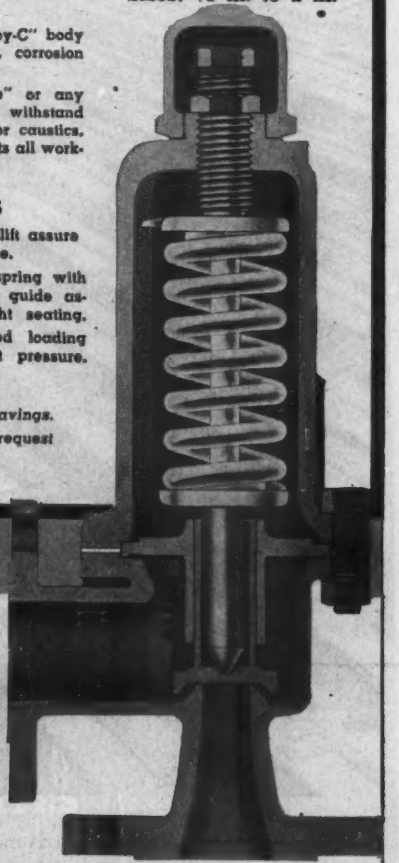

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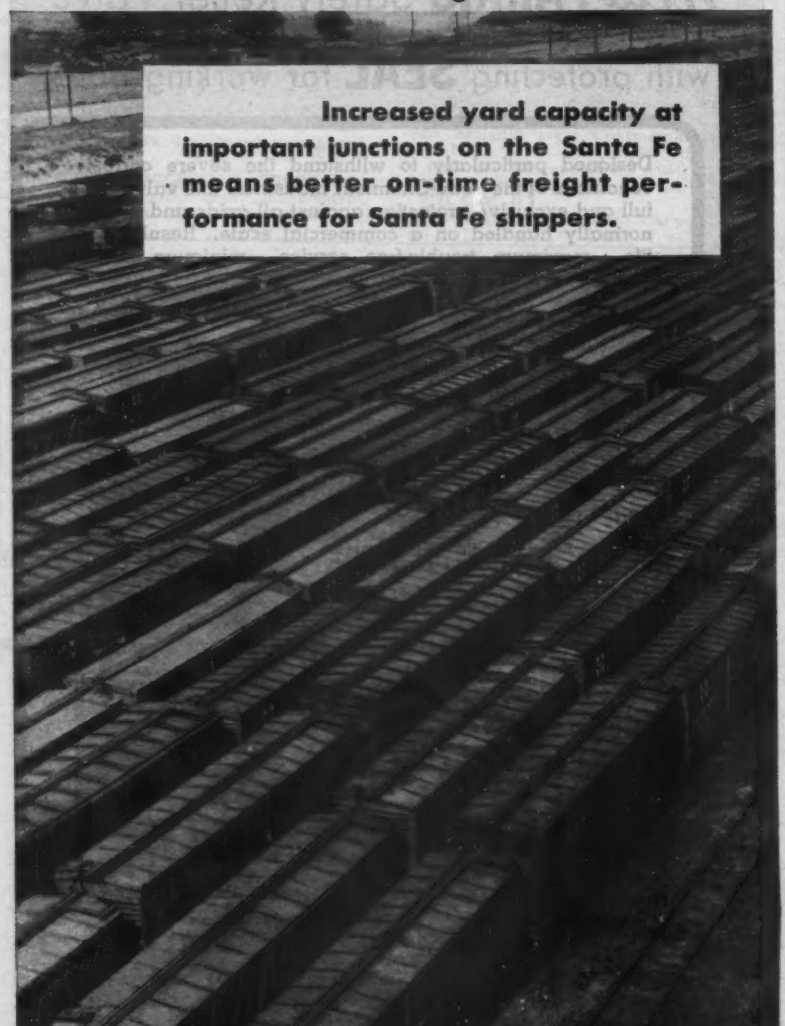
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Harris, S. C. Roach Sur., A-859, 4 mi. SW Bulcher, dry, TD 3,000 ft. in shale.

Eastland County: Frank E. Isett and L. A. Watson 1 Oscar Gage, Subd. 5, Geo. Click Sur., 2½ mi. NW Pioneer, dry, TD 2,708 ft., Caddo 2,603 ft., slight show of oil and gas 2,614-20 ft.

Haskell County: T. D. Humphrey 1 Gertrude Swan, H. R. Craig Sur., A-103, 12 mi. E Haskell, dry, TD 5,670 ft., Palo Pinto 3,396 ft., Mississippi 5,262 ft., recovered 15 ft. free oil 5,269-73 ft., Ellenburger 5,528 ft., elev. 1,475 ft.

Montague County: C. J. Simpson 1 S. W. Heard, Sec. 3, Limestone School Land Sur., 2½ mi. SE Stoneburg, dry, TD 6,306 ft., Caddo 6,066 ft.

Young County: Moco Oil Co. 1 Harvey Henning, Sec. 76, TE&L Sur., 8 mi. SW Olney, dry, TD 1,106 ft., Gunsight 1,070 ft.

EASTERN TEXAS

No Shows Reported in Offset to Discovery

DALLAS.—Hiawatha Oil & Gas Co.'s north offset, the 1 Whitton, to its recent San Augustine Pettit limestone discovery, the 1 Johnson, was said to have total depth at 8,245 ft., apparently still in the Pettit zone, but no oil has been reported. The discovery well, 6 miles north of San Augustine, completed for 93 bbl. of oil a day from the Pettit at 8,130-60 ft., last May. While no official information has been released on the second well, earlier reports were that a third test would be a west offset to the discovery. Four miles to the southwest of the discovery, Byrd & Delaney have work under way at their 1 Blount, a scheduled Travis Peak test, in the Quirk Survey.

In Harrison County, Stanolind Oil & Gas Co. 1 George Slaughter, distillate discovery 8 miles northeast of Marshall, was flowing in excess of 4,000,000 cu. ft. of gas a day, plus some 30 bbl. of 54.4°-distillate and 3 bbl. of water, through 12/64-in. choke. The well was swabbed in following acid treatment. The flow is from perforations at 6,485-6,519 and 6,517-33 ft., in the Pettit.

M. S. Slagle et al 1 Southern Pine Lumber Co., Travis Peak test 7 miles west of Mount City, Red River County, had total depth at 2,130 ft. Operators released corrected information on cores, which were: 2,102-10 ft., recovered black and red shale with limestone streaks; at 2,122-30 ft. the recovery was 3 ft. of hard, tight, oil sand.

East Texas first reports for the week, with locations staked, or work under way, totaled 27, including 8 wildcats. New wells, by counties, were: Franklin 1; Freestone 4, including 1 wildcat; Henderson 6, including 2 wildcats; Hill 1 wildcat; Houston 1 field well, 1 wildcat; Limestone 1; Marion 1; Navarro 1 wildcat; Panola 3, including 1 wildcat; Robertson 2, Smith 1; Walker 1 wildcat; Wood 2; and Henderson 1. Field well completions for the week were: Waskom gas, 1; Marion County Shallow 1; Carthage gas 2; Norman Paul 1; and Merigal 1.

EAST TEXAS SUCCESSFUL WILDCAT

Hopkins County: Delta Drilling Co. 1 W. H. Coker, Nacogdoches University Sur., 4 mi. SE Reilly Springs, discovery, pumped 147 bbl. 21.8°-gravity oil a day from lower Eagleford perforations 4,150-65 ft., TD 4,210 ft.

EAST TEXAS WILDCAT FAILURES

Collin County: Bobby Manziel 1 R. E. Alexander, W. H. Moore Sur., between Clear Lake and Lavon, dry, TD 5,656 ft.

Lamar County: Frank W. Young 1 L. P. McCuistion, Cales Woods Sur., SE Paris, dry, TD 1,755 ft., Woodbine 1,425 ft., by samples.

Van Zandt County: Thurman Armstrong et al 1 J. F. Darnell, Anthony Gray

Survey, 3 mi. S Grand Saline, dry, TD 1,845 ft., Midway 758 ft., by samples, no shows.

B. G. Byars 1 Alex Jones, E. C. Bryant Sur., 6 mi. N Edom, dry, TD 7,164 ft., Woodbine 5,005 ft., Goodland 6,926 ft., Paluxy 7,030 ft., elev. 456 ft.

PERMIAN BASIN

TXL Field Devonian Production Extended

MIDLAND.—Phillips Petroleum Co. 1-P TXL, Section 29, Block 45, T&P Survey, extended Devonian production 1 mile north of the TXL field in Ector County when it flowed 279 bbl. of 38°-gravity oil a day, natural, through ½-in. tubing choke. The well, classed as a semiwildcat, had top of the Devonian at 7,891 ft., on an elevation of 3,347 ft., and top of pay at 7,905 ft.

Deep Ellenburger production in the Sprayberry (San Andres) field of southeastern Dawson County was in prospect when Seaboard Oil Co. of Delaware 6-A John H. Robinson recovered 1,875 ft. of clean, 38°-gravity oil on a drill-stem test from 10,591-605 ft. Location is in Section 37, Block 34, T&P Survey, just northeast of a San Andres producer and ½ mile southeast of a 7,600-ft. dry hole drilled by Seaboard several years ago into the Lower Permian, which was said to have found some shows of oil. Operators were coring ahead on last report.

In north-central Andrews County, Sinclair Prairie Oil Co. et al 1 Skelly-University recovered 5,400 ft. of oil, plus 2,500 ft. of water cushion, on a 2-hour drill-stem test in the Devonian limestone at 9,720-50 ft. The well did not flow and operators drilled ahead, and on last report had a total of 375 ft. of pay zone. A 3-hour drill-stem test from 9,750-9,800 ft. brought the water cushion to the surface in 1 hour and 16 minutes, and oil in 1 hour and 52 minutes. The well was allowed to clean itself into pits for 8 minutes, then turned into tanks, where it gaged 55 bbl. of oil in 1 hour. It was drilled to 9,840 ft., where another drill-stem test was planned. Location of the well is 2½ miles west of Shafter Lake.

In Goldsmith field, Ector County, Gulf Oil Corp. 439-E Goldsmith, Section 15, Block 44, T&P Survey, indicated Clear Fork production between the Holt and Tubb zones and underlying a large area of the field. The 439-E Goldsmith flowed 58 bbl. of oil in 1 hour, on a drill-stem test at 5,398-5,450 ft. The tool was open 1 hour and 25 minutes, bringing gas to the surface in 3 minutes, fluid in 12 minutes, and oil at the end of 15 minutes. When pipe was pulled there was an additional recovery of 1,500 ft. of oil. The well was deepened to 5,480 ft. and was to make another test. The pay zone is said to be the same as Gulf's 437 Goldsmith, in Section 28, Block 44, T&P Survey, 2 miles south and slightly west of the 439-E.

Stanolind Oil & Gas Co. 1 M. J. Hall, first deep test in the Landon (San Andres) field of Cochran County, recovered 480 ft. of oil-cut mud and an unestimated amount of gas on a 3-hour drill-stem test at 10,295-347 ft. Operators said the showing did not warrant running pipe for further tests and were to deepen. Location is Section 13, Block L, Public School Lands.

On the northwest side of Seminole (San Andres) field of Gaines County, Amerada Petroleum Corp. 9 T. S. Riley was a possible Permian limestone discovery. With total depth at 6,605 ft., packer set at 6,570 ft., a 4-hour drill-stem test brought gas to the surface in 1 hour and 50 minutes. Total recovery was 1,116 ft. of oil and drilling mud, 279 ft. of clean oil and 837 ft. of oil-cut mud. There was no water. Operators then deepend to 6,580 ft., and a 4-hour test between 6,550-80 ft. recovered 100 ft. of oil-cut mud, 100 ft. of drilling mud, and 50 ft. of water. Both showings were in the Glorietta section of the Permian. The project will be drilled to 10,500 ft., if necessary, to test the Devonian. Location is Section 229, Block G, WTRR Survey. Nearby wells produce from around 5,100 ft.

New work in West Texas set an all-time high for the number of locations staked in one week when 83 were reported in fields and 8 wildcats, for a total of 91 in 19 counties. Previous high was 79 starts, including 8 wildcats, in 18 counties, 2 weeks ago. Pecos County led in exploration work, with 3 new wells; Andrews County had 2, and Dickens, Garza and Sterling counties gained 1 each. Hockley County had 18 field locations; Andrews and Ector counties 9 each; Crane 8; Crockett, Howard and Pecos counties 7 each.

Oil field successful completions for the week were: Fullerton 11; Toborg 7; Levelland 3; Adair, Garza, Keystone, Devonian, and Keystone Colby, 2 completions each; and 1 oil completion each in the following: Martin, Means, Sand Hills (McKnight), Sand Hills (Tubb), Dunes, Foster, TXL (Ellenburger), TXL (Devonian), Slaughter, Iatan-East Howard, Barnhart, Page, Sharon Ridge, and North Ward-Estes.

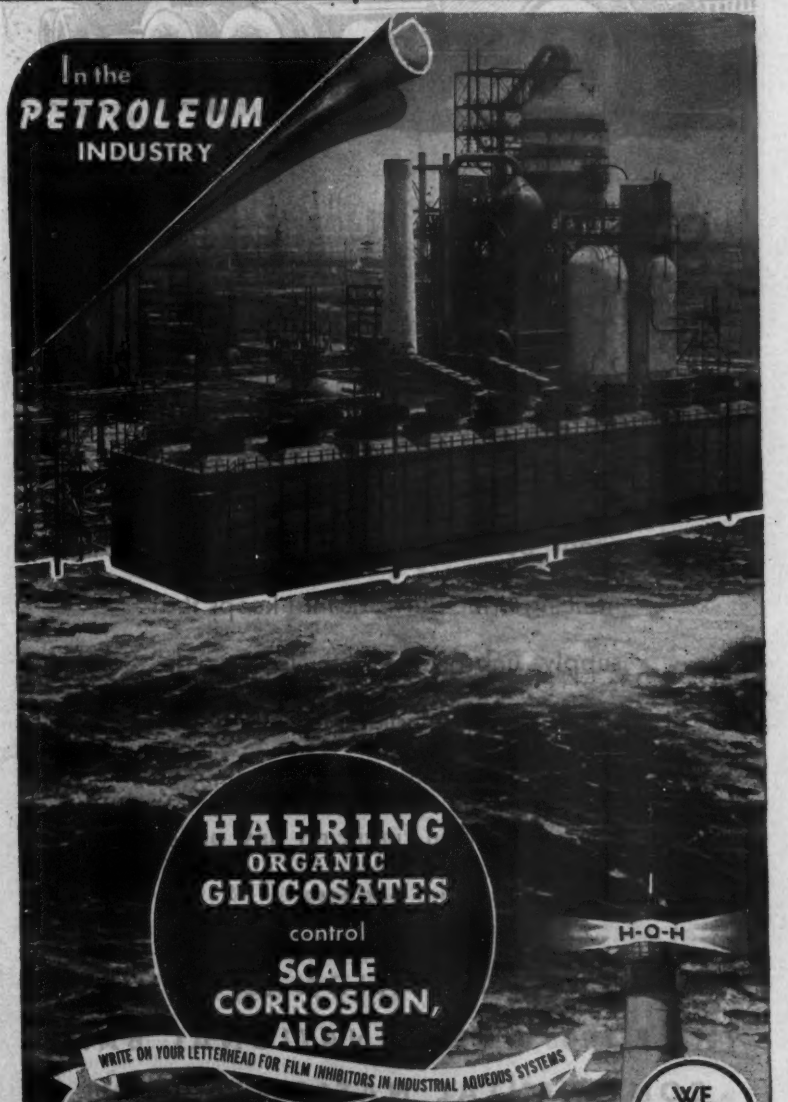
WEST TEXAS SUCCESSFUL WILDCAT

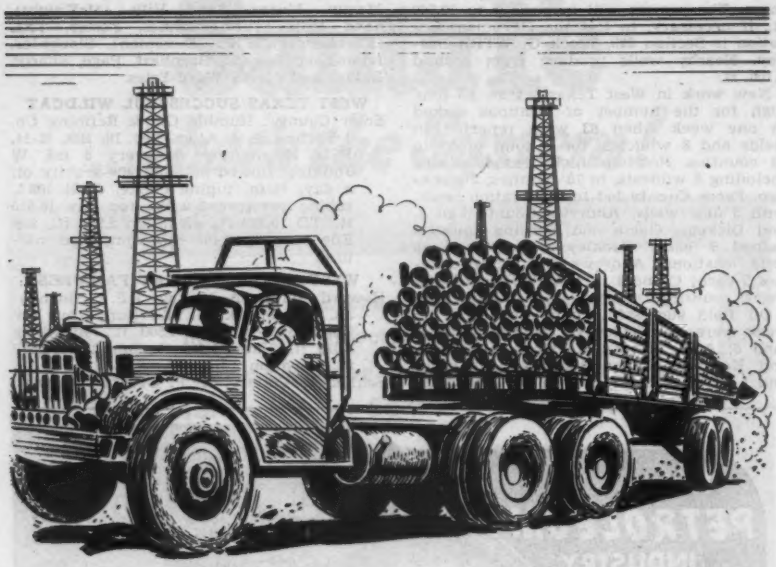
Ector County: Humble Oil & Refining Co. 1 Yarbrough & Allen, Sec. 18, Blk. B-14, PSL, Ellenburger discovery 6 mi. W Judkins, flowed 867 bbl. 40°-gravity oil a day, ⅜-in. tubing choke, GOR 708.1, tubing pressure 640 lb., top pay 10,515 ft., TD 10,620 ft., elevation 2,893 ft., top Ellenburger 10,495 ft., completed natural.

WEST TEXAS WILDCAT FAILURES

Howard County: A. M. Lacy 1 P. L. Buchanan, Sec. 39, Blk. 31, T&P Sur., 4 mi. NW Coahoma, dry, TD 4,500 ft., anhydrite 1,015 ft., Yates 1,400 ft., limestone 2,670 ft., elevation 2,518 ft.

Schleicher County: A. P. Groebl 1 Hayden





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Baugh estate, Sec. 8, Blk. M, GH&SA Sur., 4½ mi. N Page field, dry, TD 6,591 ft., Strawn 5,710 ft., Ellenburger 6,458 ft., elevation 2,354 ft.

Tom Green County: The Texas Co. 1 Wilde, M. M. Boden Sur. 1, 14 mi. SE San Angelo, dry, TD 5,300 ft.

Runnels County: Pan American 1 M. H. Willis, G. W. Denton Sur. 468, NE corner of county, dry, TD 4,262 ft., Dotham 1,540 ft., Saddle Creek 1,873 ft., Flippen sand 1,910 ft., upper Hope 2,010 ft., Gunsight 2,550 ft., Gray sand 3,989 ft., Caddo 4,147 ft.

TEXAS PANHANDLE WILDCAT FAILURE

Stanolind Oil & Gas Co. 1 J. J. Hegi, Sec. 7, Blk. S, C. S. Stephenson Sur., 1 mi. W Petersburg, dry, TD 9,974 ft., San Andres 2,640 ft., Tubb 4,908 ft., Wichita Albany 5,293 ft., pre-Cambrian 9,974 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1-A Santa Fe-Pacific, NW NW 33-10s-36e, was preparing to make production tests on shows of oil logged between 5,080-5,508 ft. Higher in the hole, between 4,938-44 ft., drill cuttings showed dolomite, bleeding oil in spots, and at 5,071 ft. there were slight shows of oil in samples. A drill-stem test at 4,913-44 ft., open 1 hour, recovered 30 ft. of mud, with no shows, and at 4,920-90 ft., open 2 hours, there was a blow of air throughout, but the recovery was 450 ft. of mud and 300 ft. of sulfur water. Location of the test is 10 miles southeast of Crossroads in northeastern Lea County.

Six miles east and slightly south of Crossroads, Mid-Continent Petroleum Corp. 1-A Sawyer, 27-9s-36e, was drilling ahead below 5,244 ft., with no shows reported.

Two deep tests in the Monument field were drilling ahead to the Ellenburger. Amerada Petroleum Corp. 5 Phillips, 1-20s-36e, was below 9,235 ft. in an unidentified formation, and the same company's 2 Record, 25-19s-35e, was below 7,100 ft. in dry limestone. The 2 Record previously had shows of oil in samples from 5,485-5,510 ft., but a drill-stem test recovered a small amount of mud, with no shows.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: Devonian Oil Co. 1 Santa Fe-Pacific RR, NE SW 10-9s-37e, dry, TD 5,210 ft., anhydrite 2,300 ft., salt 2,410 ft., limestone 4,205 ft., Slaughter zone 5,041 ft., elevation 4,000 ft.

MISSISSIPPI

Franklin Discovery Well Awaits Completion Gage

JACKSON. — Final completion gage has not been made at J. C. Hawkins 1 Lehman Brothers, 27-1n-2e, Franklin County, new discovery well, located approximately 8 miles east of Cranfield field, and 25 miles from the Louisiana border. A recovery of 2,800 ft. water cushion and 970 ft. of heavy mud was made on drill-stem test through perforations at 10,549.5-10,551.5 ft. After reperforating 10,550-552 ft., a second drill-stem test recovered 1,800 ft. water cushion, 2,300 ft. of mud, and 6,000 ft. of salt water. After swabbing 5 hours and 40 minutes the well had a fair gas show and slight trace of oil, with salt water level standing approximately 300 ft. from top. Operators are preparing to set 5½-in. securalog liner to 10,625 ft. before making next production test.

At Ovett, Jones County, Gulf Refining Co. 1 L. L. Majors, 29-6n-11w, set bridge plug at 12,857 ft. to temporarily shut off perforated zone 12,880-938 ft. for further tests on the upper zones. On drill-stem test of perforations 12,676-88 ft., recovered 10 bbl. of mud cut with dark brown to black oil in 21½ hours. A previous drill-stem test through perforations at 12,537-

60 ft., flowed at the rate of 133 bbl. of 30°-gravity oil per day through ⅝-in. bottom choke, top pressure 35 psi. to 60 psi. These perforations have been treated with 3,600 gallons of 15 per cent hydrochloric and well is now flowing back the oil load at the rate of 6 bbl. per hour through 3/16-in. tubing choke, tubing pressure 200 psi.

Gulf Refining Co. 1 R. W. Trotter, T5-7n-2w, in Hinds County, recovered 25 ft. of oil-cut mud, on test through perforations at 5,455-86 ft., using ¼-in. choke at top and ⅝-in. choke on bottom, with tool open 25 minutes. Hole is being reamed to core ahead.

Two new wildcat starts were reported, one each in Claiborne and Jones counties. Three development locations were reported, one in Heidelberg field-West, Jasper County, and two in LaGrange field, Adams County.

MISSISSIPPI WILDCAT FAILURES

Covington County: Humble Oil & Refg. Co. 1 Covington City Board of Supervisors, 16-9n-17w, dry, TD 10,005 ft. Schlumberger tops: Wilcox 2,912 ft., Midway 5,927 ft., Eutaw 7,912 ft., Marine Tuscaloosa 9,249 ft., Lower Tuscaloosa 9,397 ft., Massive sand 9,731 ft., Comanche 9,830 ft.

Jones County: H. E. Williams 1 State, SW SE 16-7n-11w, dry, TD 9,316 ft. Schlumberger tops: Marine Tuscaloosa 8,737 ft., Base Marine Tuscaloosa 8,947 ft., Massive sand 9,284 ft.

FLORIDA WILDCAT FAILURE

Walton County: D. E. L. Byers 1 Earl Edwards, SW SW 28-5n-21w, dry, TD 5,270 ft., Schlumberger tops: Midway 2,185 ft., Cretaceous 2,543 ft., Eutaw 3,981 ft., Lower Tuscaloosa 4,668 ft., Massive sand 4,864 ft., Comanche 5,012 ft.

CANADIAN FIELDS

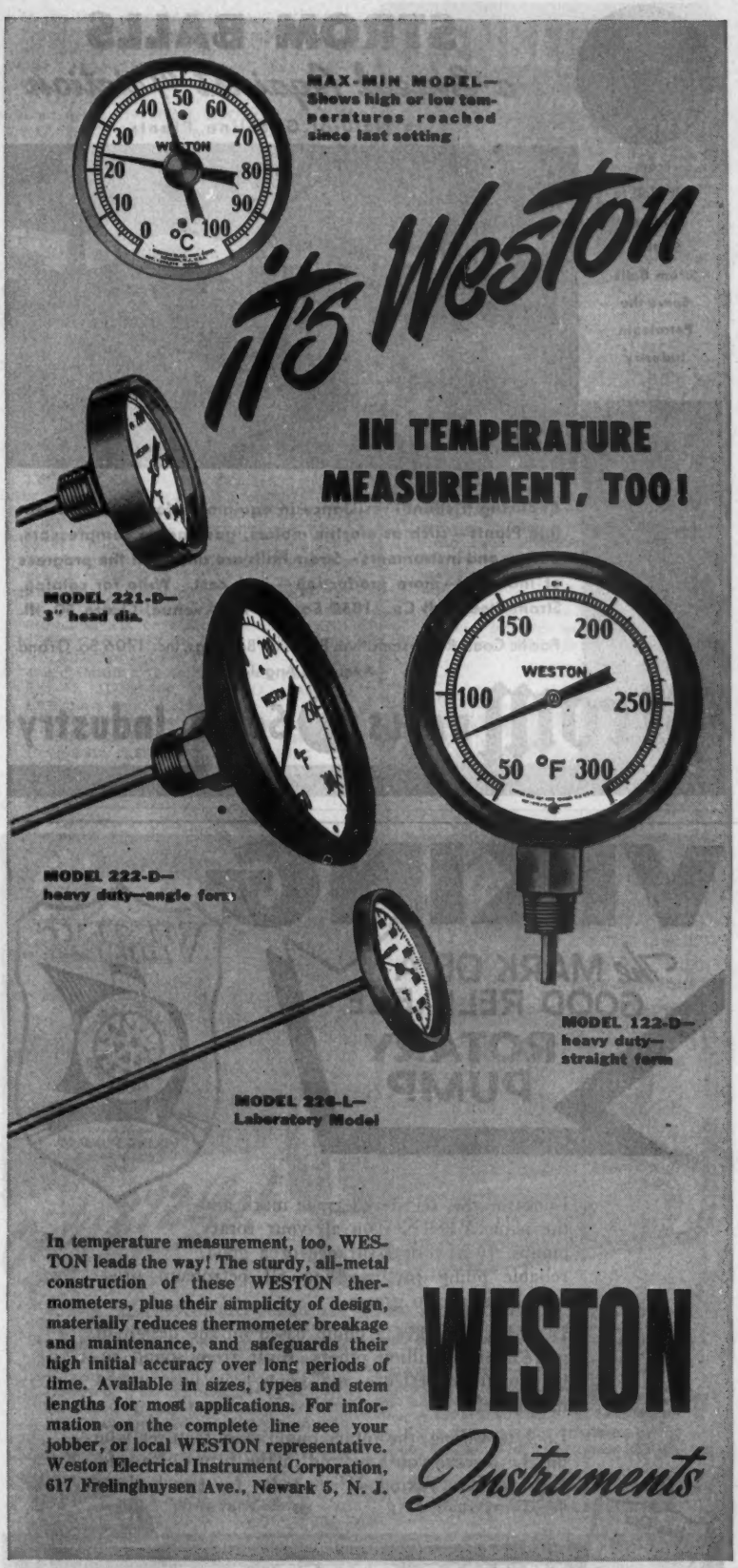
Leduc Gets 2½-Mile West Extension

CHATHAM.—In the Leduc field, Globe-Leduc West 1, LSD 6, 10-50-26w4, the second producer in the field by an independent, extends the proven area 2½ miles to the west. A drill-stem test above 5,050 ft. gave a 72-ft. rise of oil-cut mud. At 5,070-80 ft. another test gave 65 ft. rise with 63 ft. of clear oil in 1¾ hours. Hole was cored to 5,090 ft. with gas flow of 230,000 cu. ft. a day, and oil rising to the surface. After coring 10 ft. farther to 5,100 ft., final test was made, indicating a good producer. Globe-Leduc West 3, LSD 10, 34-50-26w4, is below 1,200 ft.

B. A. Oyrcz 1, LSD 12, 25-50-26w4, has been abandoned at 7,007 ft. after failing to get the third zone of the Devonian limestone. Leduc Consolidated 1, LSD 10, 23-50-26w4, is suspended at 5,402 ft. and Leduc-Consolidated 3, LSD 15, 23-50-26w4, at 5,120 ft. Both will likely be abandoned. Leduc Consolidated 2, LSD 7, 23-50-26w4, at 5,358 ft. is testing shallow porosity above the water line.

Imperial-Leduc 7, LSD 4, 15-20-26w4, bottoming at 5,397 ft., is on steady production, making 79 bbl. daily through ⅛-in. choke. Imperial 11, LSD 9, 21-50-26w4, showed 450,000 cu. ft. gas and started flowing oil on an initial test, after which it cored to 5,070 ft. in the second zone and later into green shale at 5,105 ft. and is finishing at that depth. Imperial 12, LSD 12, 22-50-26w4, bottoming at 5,291 ft., flowed 146 bbl. flush in 5 hours, later dropping to 49 bbl. in 24 hours. Imperial 13, LSD 4, 23-50-26w4, finished at 5,385 ft., with flush flow of 54 bbl. an hour, later making 297 bbl. in 21 hours on partly restricted flow. Imperial 14, LSD 9, 26-50-26w4, got the third zone at 5,212 ft., and is testing.

Homestead-Yaremko 1, LSD 7, 19-50-26w4, bottoming at 5,365 ft., is testing. Two other tests are drilling with eight lo-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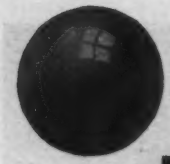

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cations in the main field. South and east of production, New Ranchmen's-Community 1, LSD 11, 7-49-24w4, finished at 5,550 ft. and is testing.

In the Millet area, farther south, Millet-Leduc 16-6, LSD 16, 6-48-24w4, is below 5,537 ft. and deepening for the third zone of the Devonian.

Jumping Pound.—Shell Exploration 5-7-I, LSD 5, 7-25-4w5, is below 14,418 ft. and believed nearing the bottom of the Devonian limestone with no indications of production. Considerable gas was indicated in the overlying Madison limestone.

Bruderheim.—On the Bruderheim structure north of Edmonton, Shunda B-1 has been electrologged in the Devonian limestone at 3,684 ft. and will be abandoned.

KANSAS

Carroll Pool Extended Half-Mile by Bridgeport

BRIDGEPORT OIL CO. has extended Carrol pool of Barton County, ½ mile to the southwest with its 2 Meitner "A," SW SW NW 28-17-14. The Meitner topped Lansing at 3,085 ft., and recovered 650 ft. of oil and 90 ft. of oil-cut mud on a 30-minute drill-stem test of 3,095-3,110 ft. Casing was set at top of Arbuckle at 3,359 ft. and hole bottomed at 3,370 ft. This well is ½ mile north of Bridgeport's 1 Hunt "A," NE NE NE 32-17-14, discovery well of Southwest Carroll pool which opened in July. The Hunt had a potential of 180 bbl. from Lansing-Kansas City.

A good oiler is being added to Beaver Northwest pool of Barton County by Phil-Han Oil Co. 1 Standinger, SE SW SW 5-16-12w. Total depth is 3,294 ft. and the hole is plugged back to Lansing lime which was topped at 3,036 ft. Following perforations at 3,118-38 ft. and light acid treatment, the well swabbed 10-15 bbl. of oil per hour.

Pipe has been set at a wildcat 1½ miles east of Kraft-Prusa field, Barton County, the Bennett & Roberts, Inc., 1 Eafeld, SE SE NW 15-16-11. Arbuckle was hit at 3,343 and hole bottomed at 3,345 ft.

Gulf Oil Corp. has had a show of oil and gas from Mississippi sand at its rank wildcat in Comanche County, 1 Lorimor, C SE SW 36-31-20, 8 miles northwest of Coldwater. Casing was set in Mississippi at 5,194 ft. after total depth of 6,365 ft. in Arbuckle was reached with no shows in Viola, Simpson, or Arbuckle. Initial test showed 2½ bbl. of oil per hour and 240 M.f.c. of gas from a plug-back depth of 5,290 ft. After 2,000 gal. acid treatment, the well tested 7½ bbl. of oil per hour and 248 M.f.c. of gas. This test hit Viola at 5,968 ft., Simpson at 6,146 ft., and Arbuckle at 6,306 ft.

Phillips Petroleum Co. has completed its 1 Ochel, NE NE SW 15-22-13, in the recently-opened Kenilworth pool in Stafford County. The well had a potential of 688 bbl. from Lansing-Kansas City after being completed through perforations from 3,504-15 ft. The pool-opener, Ed Adair and Howard Brunson 1 Howard, NW NW SE 15-22-13, made a potential of 307 bbl. from same pay.

KANSAS WILDCAT FAILURES

Cowley County: E. H. Adair 1 Anderson, NE SE SW 12-31s-4e, dry, TD 3,250 ft., Kansas City 2,320 ft., Mississippi lime 2,963 ft., Basal Mississippian 3,067 ft., no shows.

Rooks County: Anderson-Prichard et al 1 A. C. McCormick, NE NE NW 6-8s-19w, dry, TD 3,425 ft., anhydrite 1,407 ft., Heebner 3,065 ft., Lansing-Kansas City 3,104 ft., Basal Kansas City 3,326 ft., Arbuckle 3,368 ft.

Bennett & Roberts and Vickers Petroleum 1 Barber, NE NE NE 31-9s-18w, dry, TD 3,740 ft., anhydrite 1,615 ft., Topeka 3,142 ft., Lansing-Kansas City

3,396 ft., Heebner 3,355 ft., Dodge 3,376 ft., conglomerate 3,632 ft., Arbuckle 3,710 ft.

OKLAHOMA

Shallow Oiler Hit Near Recent Deep Discovery

SUNRAY OIL CORP. has hit pay at 1,760-80 ft. with its 1 Frank Romine, an outpost well southwest of the discovery well of the deep Eola pool, southern Garvin County, Sunray's well is in Arbuckle while the Eola discovery, Sohio Petroleum 1 Howard, was still in McLish sand after drilling to total depth of 10,818 ft. The 1 Romine, NE NW SE 19-1n-2w, topped Arbuckle at 1,715 ft., cored at 1,770-80 ft. and then ran drill-stem test of the cored zone. On 30-minute test 489 ft. of 22° A.P.I. gravity oil was recovered giving the well an estimated 20 bbl. per hour fill-up.

Another Garvin County wildcat of interest is Western Oil 1 Hamilton, NW SE SW 11-3n-2w, in Antioch area which has indicated Pennsylvanian at 5,320 ft. The 1 Hamilton topped Pennsylvanian at 5,320 ft., cored 5,325-43 ft. showing 18 ft. of saturated sand, and then ran drill-stem test at 5,323-57 ft. In 23 minutes, the test showed gas in 1 minute for an estimated flow in excess of 10,000 M.c.f. daily, and flowed distillate. There was 30 ft. of distillate in the pipe and a flow pressure of 1,200 lb. at the surface was registered using a ½-in. bottom-hole choke and ¾-in. upper choke.

The test is 1 mile east and north of North Antioch pool and 1¾ miles northwest of another wildcat, Cities Service Oil Co. 1 Ned Biffle, which opened a pool southeast of Antioch in Pennsylvanian sand.

The 1 Biffle, NW SW NE 23-3n-2w, hit pay at 5,424-48 ft. and is being tested. After a 5-hour shut-in period, it flowed 64 bbl. of 52° A.P.I. gravity oil in 10 hours through a ¾-in. choke. Tubing pressure of 1,925 lb. was noted.

Northeast Elmore pool of Garvin County has been extended by Carter Oil Co. 1 I. A. Nichols, NW NW NE 23-2n-2w, which flowed 279 bbl. of oil in 24 hours through ¼-in. choke. Total depth is 6,548 ft. with Mayes lime at 6,540 ft. and perforations at 6,449-60 ft. The well kicked off without swabbing.

Wave Exploration Co. and Stanolind Oil & Gas Co. are testing first Wilcox sand at their 1 Luckinbill, 12-15n-3w, south of Seward in Logan County. The test was cored at 6,030-40 ft., recovering 6 ft. of fairly porous sand with some staining.

OKLAHOMA SUCCESSFUL WILDCATS

Creek County: Engineered 1-A Blaylock, NE NE NW 28-14n-8e, pumped 5 bbl. of oil per day from Skinner at 2,940-2,510 ft., TD 3,012 ft.

Okfuskee County: New pay in Weleetka District—Fleming 3 Harjo, NW SE NW 18-10n-11e, pumped 240 bbl. of 41°-gravity oil per day from Simpson sand at 1,640-45 ft., TD 1,645 ft.

Wells 1 Rose, SE NE SE 29-10n-12e, 1,000,000 cu. ft. gas from Booch at 1,978-95 ft., TD 1,995 ft.

Oklahoma County: Gulf 1 Frazier, C NE NW 11-12n-2w, flowed 36 bbl. of oil per day from Bartlesville at 6,089-93 ft., TD 6,748 ft.

Stanolind 1 Reinhart, C SW SW 30-13n-2w, flowed 191 bbl. of oil per day from 6,363-92 ft. through 18/64-in. tubing choke, TD 6,406 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Amerada 1 Cathey, C NE NE 29-4s-3w, dry, TD 7,952 ft., no tops reported.

Cleveland County: Whisnandt 1 Ward, C SW NW 33-6n-1e, dry, TD 6,568 ft., no tops reported.

Cotton County: Kerr 1 Be-Nah, SW SW NW -2s-11w, dry, TD 3,028 ft., Caney lime 2,964 ft., no show.

Winfrey 1 Dickson, SE SE NW 1-5s-13w, dry, TD 1,851 ft., Megargel lime 1,680 ft.

Garvin County: E. T. & Al Oil 1 Kirkpatrick, SE SE NW 24-4n-3e, dry, TD 3,185 ft., no tops reported.

Greer County: Gillespie 1 Stooksberry, NE NW SE 9-7n-21w, dry, TD 1,549 ft., grey lime 1,080-74 ft., anhydrite 1,103-68 ft., anhydrite and shale 1,248-1,300 ft., Granite wash 1,340-82 ft., black granite 1,523-49 ft.

Hughes County: Maguire 1 Pollack, SW SW SE 10-5n-8e, dry, TD 3,080 ft., Semore lime 1,025 ft., crown lime 2,235 ft., Gilcrease 2,665-2,876 ft., Union Valley 2,990 ft., Cromwell 3,058 ft.

Okfuskee County: Gillespie 1 Atchison, SW SE SE 11-10n-10e, dry, TD 1,645 ft., Earlsboro sand 1,610-18 ft.

Payne County: Kingwood 1 Downey, NW NW NE 22-18n-1e, dry, TD 5,198 ft., Pawhuska 1,831 ft., Avant 3,014 ft., Dewey 3,143 ft., Perry 3,217 ft., Layton 3,400 ft., Hogshooter 3,817 ft., Check-

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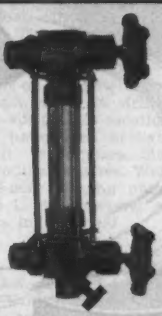

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Pontotoc County: Gem Oil 1 Tanner, NW NE SW 8-5n-6e, dry, TD 2,550 ft., coal 1,740 ft., Senora lime 1,791 ft., Mississippi Caney 2,410 ft.

Seminole County: Sherry-Carter 1 Black, SE SE SE 16-9n-8e, dry, TD 3,680 ft., coal 2,006 ft., brown lime 3,020 ft., Booch 3,185-3,204 ft., Gilcrease 3,338-45 ft., Lower Cilcrease 3,430-37 ft., Wapanucka 3,601 ft.

Tillman County: Mid-Continent 1 Perry, SE SE SW 30-1s-16w, dry, TD 1,740 ft., Granite wash 510-58 ft., Granite wash and lime 558-83 ft., lime and chert 1,096-1,104 ft., hard lime 1,104-36 ft., hard sand 1,164-66 ft., hard lime 1,183-1,278 ft., conglomerate 1,491-94 ft., schist 1,494-1,599 ft., shale and schist 1,599-1,638 ft. and 1,693-1,740 ft.

ILLINOIS

Dye et al Hit Good Well In Berryville Pool Area

MATTOON.—An initial pumping production of 250 bbl. of oil per day has been chalked up for the A. F. Dye et al Wabash County wildcat, 1 Paul Clodfelter, NW½ 36-2n-14w. This test was completed in McClosky limestone at 2,912-21 ft. after a 2,000-gal. acid treatment. It is near the junction of Wabash, Richland and Lawrence counties in Berryville pool area. Closest production is ½ mile away. Operators have staked location for 2 Paul Clodfelter, NE NW NE 36-2n-14w.

National Associated Petroleum has a promising wildcat in Effingham County, the 1 Martin Will, 1,121 ft. from south and 330 ft. from west lines NE, 1-8n-6e. On test of McClosky at 2,416-26 ft., after 1,500 gal. acid treatment, the well swabbed 40 bbl. of oil per day. Operators set 5½-in. casing at 2,415 ft.

ILLINOIS SUCCESSFUL WILDCATS

Wayne County: Wrather 1 Turner, SW NE NW 23-1s-9e, IP 60 bbl. of oil per day from Rosiclare, TD 3,375 ft.

ILLINOIS WILDCAT FAILURES

Clark County: McNary 1 Cunningham, NE SE SE 25-11n-14w, dry, TD 487 ft.

Clay County: Everhart 1 Bonney, SW SE NE 20-4n-7e, dry, TD 3,112 ft.

Cumberland County: Reznik 1 Marshall, NW NE SE 17-10n-8e, dry, TD 2,501 ft.

Fayette County: Bell 1 Weaver et al, NE SE SE 13-5n-4e, dry, TD 2,653 ft.

Gallatin County: National Associated 1-A Maye, NE SE SE 25-11n-14w, dry, TD 487 ft.

Marion County: Puritan Drilling Co. 1 Quandt, SE SE NW 2-1n-3e, dry, TD 2,743 ft.

Montgomery County: Kesler 1 Asterman, SE NE SW 11-7n-4w, dry, TD 907 ft.

LA.-ARK.

Prospective Discovery Coring Below 8,413 Ft.

SHREVEPORT.—Pan American Producing Co. 1 Elva Bugg, prospective discovery in 31-20n-1w, 9 miles southwest of Farmersville, Union Parish, was coring ahead below 8,413 ft. A drill-stem test at 8,368-78 ft., using ¼-in. choke and 1,000 ft. of water cushion, blew an unestimated amount of gas and recovered part of the wash water. The tool was open 6 minutes. Cored on down to 8,383 ft., the recovery was soft, gray sand with gas odor.

In Bienville Parish, Union Producing and Pure Oil Co. 1 L. P. Frazier, 14-14n-6w, was shut in, waiting on gage, after flowing an estimated 15 to 20,000,000 cu. ft. of gas a day through ¼-in. choke from perforations in the James limestone at 6,730-52 ft. Operators had released the rig on last report. In 14-17n-6w, Lion Oil Co. 1 Colbert was drilling ahead below 6,468 ft., and believed to be in the James limestone. Sample tops reported were: Massive anhydrite 5,430-5,710 ft., first Rodessa porosity 5,950 ft., second Rodessa porosity 6,005 ft., and the James at 6,318 ft.

In Bossier Parish, 1 mile west of the Bellevue field. J. T. Parks 1 Lodwick Lumber Co., 17-19n-11w, had to kill the well and squeeze perforations at 1,948-52 ft. when it blew out, making salt water and a show of oil. Total depth was 1,957 ft., and scheduled depth was 3,000 ft.

West of the Stephens field, Columbia County, Arkansas, McAlester Fuel Co. 1-A W. N. Paschal had total depth of 6,597 ft. in the Smackover. Operators perforated at 6,561-63 ft., and a 1-hour drill-stem test produced a slight blow and recovered 62 ft. of salt water with a scum of oil. Plugged back to 6,542 ft., and perforated at 6,526-41 ft., a second test recovered 5,400 ft. of salt water with a scum of oil. Perforations were squeezed, cement drilled out, for further perforations.

NORTH LOUISIANA WILDCAT FAILURES

Madison Parish: C. H. Murphy and Sun Oil Co. 1 R. F. Marston, 19-16n-10e, dry, TD 5,234 ft., swabbed fresh water and trace of oil 4,909-11 ft., no tops reported.

Morehouse Parish: Union Oil Co. of California 1 J. W. Thompson NW NE NW 19-19n-6e dry TD 2,401 ft.

OHIO, KENTUCKY

Two Wells Added to Elyria City Gas Field

COLUMBUS.—A gas pool of some size now appears to underlie the southeast part of the City of Elyria. Two completions this week have been added to two small wells that had been previously drilled. Elyria Iron & Steel Co. 1 fee, Section 3, Carlisle Township, Lorain County, logged the Clinton sand at 2,284-99 ft. with a small pay at 2,285 ft. and the big pay at 2,289-98 ft. Total volume of gas gaged 3,400,000 cu. ft. natural. In Elyria Township, and 1½ miles to the north, Colson Co. 1 fee found the Clinton at 2,296-2,310 ft. with 506,000 cu. ft. natural.

The Preston Oil 1 Edward Forsythe, Section 27, Madison Township, Perry County, a north offset to the Crossan No. 1, made 51 bbl. with 160,000 cu. ft. gas in 24 hours after shot. Clinton sand was reported at 3,256-3,304 ft.

Ohio Fuel completed a small well on M. J. Deaver et al, Section 26, York Township, Morgan County, that extends Tropic pool ½ mile to the north. Medina sand at 3,908-16 ft. gaged 136,000 cu. ft. natural and 359,000 cu. ft. when shut in after shot.

Two wildcat wells have been started in Malta Township, Morgan County. National Gas & Oil 1 Mary A. Smith, Section 9, is drilling and Beasly et al 1 Luther Tippie, Section 15, has the rig up.

Locations are down to 17 this week from 28 the previous week. Perry County reported four, Monroe three, and Stark, Muskingum, and Morgan two each. Lancaster field led in completions with 8 out of a total of 21.

OHIO WILDCAT FAILURES

Wayne County, Congress Township: Ohio Fuel Gas 1 C. E. Palmer, Section 22, Clinton 3,064-71 ft., TD 3,168.

EASTERN KENTUCKY

ASHLAND.—Three new locations and cancellation of one previously announced location highlighted an otherwise uneventful week. Kentucky-West Virginia Gas Co. announced locations for No. 871 on Joseph Hall property in Knott County, No. 5,770 on the Henderson Hall in Floyd County, and No. 5,775 on the A. W. Stratton in Pike County. No. 5,773 on the J. S. Franklin in Knott County was canceled.

WESTERN KENTUCKY

OWENSBORO.—O. O. Borden 2 O. C. Whitfield, 1-K-25, wildcat 2½ miles east of Hansen and 6 miles northeast of Madisonville, Hopkins County, has hit Tar Springs pay. On 2-hour drill-stem test of 2,296-2,315 ft., the test got gas in 15 minutes, 1,800 ft. of clean oil, 20 ft. of oil-cut mud, and no water. This prospective pool-opener is 6 miles southeast of the recently opened prolific Slaughters pool.

Development of Slaughters pool continues at a rapid pace with six drilling wells in the field and six proven locations. To date, 14 producers have been brought in and 4 dry holes hit. It appears there will be around 300 productive acres. Wells are being drilled on 10-acre spacing pattern. George S. Engle and 1. B. Browning are the only two operators in the field.

INDIANA

EVANSVILLE.—Barsland Oil Co. has hit pay with a wildcat in Miami County in north-central part of the state. The test, 4 Frank Pillott, 330 ft. from south line and 165 ft. from state highway 31, 21-27n-4e, bailed 100 bbl. of oil in 8 hours from Trenton limestone zone at 840-48 ft. Total depth is 848 ft. The well is located near town of Peru and the abandoned Peru field, and is the first to hit Trenton pay in the area.

The new Evansville pool in Vanderburgh County has been partly defined by two dry holes. Louie K. Hamilton 1 Vernon Gantner Community, NW NW SE 2-6s-11w, was dry and abandoned at total depth of 1,100 ft., and Superior Oil Co. 1 Ludwig, SE NE SW 2-6s-11w, was dry at 869 ft.

INDIANA WILDCAT FAILURES

Vanderburgh County: Schoonmaker 1 Angermeier, NE SE NE 26-5s-11w, dry, TD 1,000 ft.

FOR SALE

TO CLOSE AN ESTATE

OIL AND GAS LEASE, 120 acres, Two producing wells, derricks, pump houses, and all machinery and equipment.

Also 160 acres of land adjoining said lease.

Located about six miles east of Kildare, Kay County, Okla.

Sealed bids to be opened in the office of the County Judge of Kay County, Oklahma, at Newkirk, Oklahoma, on October 18, 1947, at 10 o'clock A.M.

Bids to be filed with said County Judge or with Roy Harvey, Executor of the estate of John E. Hosack, Deceased.

Roy Harvey, Executor

P.O. Box 83, Office 110½ E. Grand Ave.
PONCA CITY, OKLAHOMA

Conciliatory FPC Attitude Indicated by Smith

(Continued from page 46)

the United States will pile on the back of gas—and gas is not big enough to carry it."

Opposing any government regulation of fuels competition, Ball said the remedy lies in the free play of the market place, a proper price relationship. He also opposed regulation of field prices of gas, saying this is the area where price can be fixed by competitive value and should be as free from regulation as the production and gathering of coal or oil.

Ball suggested that heating oil will never again be in abundant supply, but warned that in the next few years the coal industry may make real efforts to recapture markets lost to gas. "The important thing," he concluded, "if coal is not to lie in the ground unmined while gas carries more of the fuel load than it should, is not how much gas prices go up or how much coal prices come down, but that the two compete to a proper price relationship. We must be sure to keep an area within which the price of gas, like that of coal, is regulated solely by the law of supply and demand."

Coal Official Urges Cooperation

Speaking at the October 8 general session on "Will Coal Help to Meet the Future Needs for Gaseous and Liquid Fuels?" Joseph Pursglove, Jr., vice president in charge of research for the Pittsburgh Consolidation Coal Co., said that it was necessary for the coal, gas and oil industry to find a common ground on which to work together.

"The time may come," he said, "when you in gas, or those in oil, will have to decide whether there are not certain energy applications better served by coal, thus freeing increments of gas and oil to do a better job in other consuming fields, all to the end that the American consumer is served at less cost."

Pursglove told the A.G.A. that while the cost of manufacturing liquid fuels from gas is still prohibitive, insofar as marketing the products is concerned, that great progress is being made by oil-company and other research concerns in the United States.

"If we want carbon monoxide and hydrogen gases . . . why don't we use the conventional water-gas sets that make exactly that?" the speaker asked, then answered the question by stating that "we just can't afford the known costs of producing these gases by the conventional methods of today. If we could sell gasoline for double or triple the present wholesale market price, that would be splendid (and easy), but I don't know of any customer who would be so generous with us for the privilege of saying 'I run my car on gasoline made from coal.'" The speaker continued:

"Moreover, we can't afford the cost of the preliminary coking process. We must gasify the coal directly. We must gasify huge quantities of raw coal per hour in single retorts or vessels. All known present methods of gasifying coal directly are small, low-capacity units completely unsuited to our American fuel economy based as it is on large, high-capacity units.

"We are thinking of a relatively large commercial-size gasification vessel in which a bed of fine coal is fluidized by a current of steam and oxygen (or air) passing up through the bottom of the vessel. Such a vessel might consume several thousand tons of coal every 24 hours and would produce many, many millions of cubic feet of carbon monoxide and hydrogen gases a day —probably in multiples of hundreds of millions of cubic feet."

Will Build Pilot Plant

Pursglove explained that his company and Standard Oil Development Co., jointly, will build a large-scale pilot plant near Pittsburgh to explore the possibilities of making a gas out of coal on a vast scale. *(The Oil and Gas Journal, April 5, page 46.)*

Speaking of the coal refinery of the future, Pursglove said that the coal will be crushed to a rather fine size and fed directly into a large gas generator where it will be converted to carbon monoxide and hydrogen gas, leaving only the inert ash to be removed from the generator. The gas will be cleaned to free it from dust, sulfur and other impurities and then it will be passed directly into the synthesis reactor filled with a finely powdered catalyst. In this reactor, he explained, high-octane gasoline, diesel oil, fuel oil, alcohols, and methane gas will be formed.

Pursglove said a vast oil-from-coal industry is not on the immediate horizon, as there are numerous major problems which must first be solved.

R. H. Hargrove, A.G.A.'s outgoing president and president of the Texas Eastern Transmission Corp., in his president's address October 6 said:

"It is crystal clear . . . that we cannot sidestep the responsibilities that free competitive enterprise has entrusted to us. If we exercise proper conflicting leadership there will be little temptation for others who support conflicting philosophies to take the helm and control our destinies. We must solve our problems with our own resources or accept the inevitable consequences."

Speaking of construction expenditures of gas utilities, Hargrove said that of a peak $310,000,000 spent in 1946, $117,000,000 was spent for natural-gas transmission facilities to attempt to satisfy the great demand for this fuel in industrialized areas. An estimated $730,000,000 will be spent by utilities for new gas facilities in 1947, with more than half of the total going to natural-gas transmission. More than 320,000 miles of mains were in use by the gas utility industry at the end of 1946, a gain of 10,140 miles over 1945, the A.G.A. president said.

Offshore-Drilling Papers Feature A.I.M.E. Meeting

(Continued from page 55)

uate the effectiveness of selective acidizing, selective plugging, and selective shooting in corrective work. R. J. Pfister of Pennsylvania Grade Crude Oil Association, Bradford, in "An Improved Water-Input Profile Instrument," reported he has developed a water-input profile instrument for this need. It is based on the introduction of brine and fresh water into an input well, with the location of the boundary between them determined electrically. Two methods are available in the use of this instrument to measure the foot-by-foot water-intake rates of the various strata: (1) the moving boundary method in which variable well-bore diameters can be determined and/or cancelled out; (2) the constant-boundary method.

Three papers which were given the previous week at the A.I.M.E. regional Petroleum Division meeting at Denver *(The Oil and Gas Journal, October 4, page 49)*, because of their wide interest were also given at the Tulsa meeting. These were: "Lance Creek Sundance Reservoir Performance—A Unitized Pressure Maintenance Project," by Lincoln F. Elkins, Continental Oil Co., Ponca City, Richard W. French, Jr., Standard Oil Co. (Ohio), Oklahoma City, and Wayne E. Glenn, Continental Oil Co., Ponca City; "Location of Water Entry Points in Oil Wells," by Daniel Silverman, Tulsa, and A. R. Brown, Fort Worth, Stanolind Oil & Gas Co.; and "Application of Dipmeter Surveys," by Everett F. Stratton, Houston, and Robert G. Hamilton, Tulsa, Schlumberger Well Surveying Co.

Truck Movement of Oil in August Increases Over 1946

Transportation of petroleum and products by motor carriers in August totaled 219,903 tons, a decrease of 9,232 tons or 4 per cent from the previous month. However, the August tonnage represented a 5.2 per cent increase over the same period in 1946, it was reported by the American Trucking Associations, Inc.

Transportation of petroleum products represents about 9 per cent of the total tonnage reported hauled by motor carriers.

Among the

Drilling Contractors

Ohio Drilling Firm Quitting Business

Lupher Drilling Co., Columbus, long active in drilling circles, is being dissolved. Inventory of equipment is being made and no additional contracts will be accepted by the firm. Top officials of the firm include: M. S. Lupher, president and treasurer; William Cline, vice president: E. G. Snider, secretary; Rondel Cline, manager; Fred Bell, rotary superintendent; H. Lynn Riggs, cable-tool superintendent; and Charles Ingmire, trucking superintendent.

Johnson-Flesher Opens Pool With "Dry" Hole

Johnson-Flesher Drilling Co., Oklahoma City, has contract for workover job on a "dry and abandoned" hole in Payne County, Oklahoma, which has turned out to be a pool opener. The well is F. G. Fox and W. J. Fox 1 Gibson-George, NW SE SW 8-17n-2e, near Perkins and east of Coyle pool. It was originally drilled in 1946 by British-American Oil Co. and was plugged after getting salt water in second Wilcox at 4,907-17 ft. Johnson-Flesher redrilled it to 4,548 ft. to the top of Hunton lime, set pipe, perforated, and shot, and flowed it through casing for 250 bbl. of oil in 10 hours.

A.B.C. Drilling Co., Los Angeles, has been given a permit by California Corporation Commission to issue 75,000 shares of stock with par value of $1. Duke Westland, A. D. Allen, and N. Chatham are directors of the company.

Kiowa Drilling Co., Wichita, has brought in a successful wildcat for Solar Oil Co. in Rush County, Kansas. Solar's 1 Tammen, SW SW SW 24-19-16, flowed an estimated 100 bbl. of oil per day from Arbuckle lime at 3,659 ft.

Meredith, Clegg, & Hunt, of Houston, are moving in a power rig for Pan American Production Co. to drill its 1 A. E. Humphreys in the John H. Pierson Survey, Abstract 389, Fetzer

Harbar Drilling Co. crew members on Sinclair 1 Ethridge in Lindsey field, Oklahoma. Front row: Joe Lawson, mechanic; Woodie Vaught, welder; M. E. Billings, toolpusher; and John Hanna, driller. Back row: Boyd Arnold, A. J. Jennings, and Johnnie Cox, crew members

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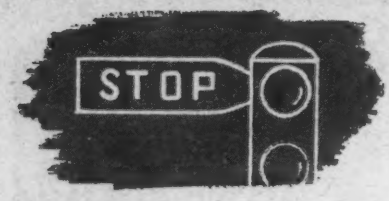

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WEB WILSON Oil Tools

W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

area, Waller County, Texas. Contract depth is 9,000 ft.

Ralph Perry, Grand Rapids, has contract for N. R. Dodd 1 Ben Selby, SE SW SE 27-4n-13w, South Salem field, Allegan County, Michigan.

Hayes Drilling Co., Mt. Carmel, Ill., will drill Lloyd E. Kennedy 2 State Life Insurance Co., 990 ft. from south and 330 ft. from west lines, SW 15-1s-12w, Knox County, Indiana. Contract is for 2,400 ft.

J. Lund, Pouce Coupe, B. C., whose test for water to supply that town encountered a surprise flow of 15 to 20 bbl. of oil at 800 ft., is carrying the test to the original contract depth of 1,000 ft.

Wilkins & Bissett have contract for a Michigan wildcat to be drilled for C. L. Maguire, Inc., and W. F. Brown in 1-34n-2w, Cheboygan County. The test will be drilled to the Richfield which is expected around 1,300 ft.

Can-Tex Drilling Co., Calgary, Alta., has finished drilling Imperial 12 producer in 1 Leduc field and is moving outfit to drill Imperial 18, LSD 13, 22-50-26w4.

Johnson Drilling & Service Co. has completed its 1 well in Pace City field, Ouachita County, Arkansas, for 136 bbl. per day through ½-in. choke from perforations at 2,798-2,803 ft. Total depth is 3,138 ft.

Goll, Graves & Mechling, Saginaw, will drill Basin Oil Co. and Don F. Rayburn A-2 State-Deep River, NE SE SW 6-19n-4e, Deep River field, Arenac County, Michigan.

V-T Drilling Co., Evansville, has received permit for its 1 C. E. Schernekau to be drilled 330 ft. from north and west lines SE SW NE 35-2n-14w, Wabash County, Illinois.

Curtis Singleton Drilling Co., Corpus Christi, Tex., has staked location for a wildcat test 16 miles northeast of Huntsville in Walker County, Texas.

Hall-Miller Drilling Co. will drill a 6,000-ft. test fo L. C. Tharpe et al, 1½ miles west of Jones pool, eastern Oklahoma County, Oklahoma. The wildcat is 1 G. H. Perry, SW SE SE 30-13n-1e, and is being supported by Shell Oil Co., Inc., and Phillips Petroleum Co.

Derby Drilling Co., Wichita, has started on its 1 O'Laughlin, NW NW NE 18-12s-18w, Ellis County, Kansas.

Gene Reid Drilling, Inc., Bakersfield, has received two recent California contracts. Hamilton & Sherman 3 Beer "B" will be drilled in Blackwell's Corner area of Kern County, and a well will be drilled for Gilmore Associates near 16th and Orange, townlot area, Huntington Beach field.

L. D. Cain Drilling Co., Houston, is preparing to complete its second well in Bloomington field, Victoria County, Texas.

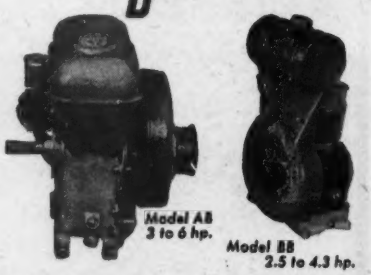
Transit Corp. is drilling a Graham County, Kansas, wildcat for Anderson-Prichard Oil Corp. The test is 1 Morris, SW SW SE 32-7-22, 3½ miles northeast of Hill City and 15 miles northwest of the Morel pool. Anderson-Prichard holds 2,400 acres around the well.

Harry Stroud, Allegan, Mich., is contractor for J. H. Fitchett 9 Katie Stewart, NE SE NE 7-1s-14w, Bloomingdale field, Van Buren County, Michigan.

Woods Drilling Co. and Wilcox Oil Co. are planning a test, the 1 Stevenson, NW SE NE 16-3n-8e, 6 miles south of Steedman pool, eastern Pontotoc County, Oklahoma. Objective is second Wilcox sand.

Hewgley Drilling Co., Jackson, Miss., has contract for a Stanolind Oil & Gas Co. wildcat in Mississippi, the 1 Couch, C NW NW 20-2n-15e, southwest of Quitman, Clarke County. Contract is for Tuscaloosa.

BEE-LINE ENGINES



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R. V. Dillard Drilling Co., Duncan, Okla., has filed intention to drill its 1 Walker, SW SE SE 29-1s-9w, a 2,500-ft. test in Cotton County, Oklahoma.

Ajax Drilling Co., Mt. Pleasant, Mich., will drill a Stony Lake field well for Carter Oil Co., the 3 Simon J. Schiller, NE SW SE 9-13n-18w, Oceana County, Michigan.

Harbar Drilling Co. has hit a producer with its 1 Meier, NE NE NE 20-15-12, Russell County, Kansas. This wildcat topped Arbuckle at 3,270 ft. and pumped 4 bbl. of oil in 8 hours.

B & R Drilling Co., Russell, Kans., has made a start on its Barton County, Kansas, wildcat, the 2 Esfeld, SE NW 15-16s-11w, 1 mile northeast of Kraft-Prusha pool. B & R also has a wildcat under way in Ellis County, the 1 Richards, NW SE 24-11s-19w, 1½ miles north of Riverview pool.

K. L. Kellog & Sons, Long Beach, have contract for Union Oil Co. 103 Stearns, Brea-Olinda field, California.

Wayne Drilling Co., Carmi, Ill., has received permit to drill its 2 Crawford, 347 ft. from south and 330 ft. from west lines, NE NW NE 26-7n-10e, Jasper County, Illinois.

Jackson Drilling Co. has hit a producer with its 2 Norton-B, SW SE NE 32-14s-2w, Saline County, Kansas. The Norton-B swabbed 5 bbl. of oil per hour from the Viola at 3,276-79 ft.

Fenpar Drilling Co., Grand Haven, Mich., is under contract for Panhandle Eastern Pipe Line Co. 1 Hazen-Latson Community, SE NW SE 7-2n-5e, Howell field, Livingston County, Michigan.

H. H. & B. Drilling Co., Wichita, is drilling a wildcat in Ellis County, Kansas, its 1 Pfannenstiel, NE NE NE 26-14s-20w, 2 miles south of Pleasant pool.

Harold Scholl is drilling a Texas Co. wildcat in Cooke County, North Texas. It is J. D. Walker, B. Lusk Survey A-569, 3½ miles southeast of Bulcher.

Cody & Terry, San Antonio, have rotary contract for a 7,500-ft. wildcat to be drilled in southwest Lamb County, Texas. The test is Forest Oil Corp., Jergins Oil Co., and H. R. Smith 1 Ida May Harris, 440 ft. from north and east lines, Labor 15, League 661, State Capital Lands Survey, 2 miles southwest of Amherst.

Dee-Watson Drilling Co. is under contract for Illinois Mid-Continent Co. 4 Edith Burkett, 150 ft. from south and 330 ft. from east lines, SW NW 24-1s-12w, Gibson County, Indiana. Contract is for 2,900 ft.

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WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 4, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	46	23	0	*23	65,892	1,269	1,207	0	0	0	0	0	3	0	0	2	5
Pennsylvania	71	39	5	†27	122,327	2,265	3,036	0	0	0	0	0	0	0	3	1	4
West Virginia	21	2	12	7	68,220	649	567	1	0	1	5	7	1	0	20	14	35
Ohio	27	5	6	‡16	69,290	1,003	942	0	0	0	1	1	0	0	5	34	39
Indiana	13	2	1	10	22,563	490	282	0	0	0	1	1	22	0	0	35	57
Kentucky	17	11	0	6	31,058	524	355	0	0	0	0	0	8	0	0	33	41
Illinois	42	15	1	26	113,269	1,557	1,740	1	0	0	7	8	56	0	1	269	326
Michigan	21	9	5	7	41,986	670	626	1	0	0	6	7	8	0	10	173	191
Kansas	62	36	7	19	200,896	1,974	1,516	0	0	0	3	3	30	0	13	260	303
Neb., Mo., Iowa	0	0	0	0	0	4	15	0	0	0	0	0	0	0	0	4	4
Oklahoma	85	44	9	§32	280,063	3,157	2,100	4	0	1	12	17	89	5	17	526	637
Texas	174	95	17	62	781,769	6,883	6,047	7	1	0	33	41	221	48	66	1,040	1,375
North Central (Dist. 7-B & 9)	47	19	1	¶27	150,894	2,213	2,162	1	0	0	10	11	64	0	9	348	421
West (Dist. 7-C & 8)	44	37	0	7	199,525	1,664	1,317	1	0	0	4	5	28	0	3	126	157
Panhandle (Dist. 10)	15	7	6	2	53,358	344	249	0	0	0	1	1	1	0	1	9	11
Eastern (Dist. 5 & 6)	10	3	3	4	50,685	400	547	1	0	0	3	4	8	2	5	87	102
Gulf Coast (Dist. 3)	26	14	5	7	166,756	1,194	1,329	2	0	0	5	7	55	34	28	222	339
Southwest (Dist. 1, 2 & 3)	32	15	2	15	160,551	1,068	443	2	1	0	10	13	65	12	20	348	345
Louisiana	37	28	1	8	152,776	1,128	1,037	1	1	0	4	6	31	18	9	154	212
Northern	26	20	1	5	60,901	647	585	0	0	0	2	2	3	1	3	93	100
Southern	11	8	0	3	91,875	481	452	1	1	0	2	4	28	17	6	61	112
Arkansas	10	6	0	4	36,024	224	140	0	0	0	0	0	1	0	0	42	43
Mississippi	11	7	1	3	104,145	365	189	0	0	0	2	2	1	0	1	70	72
Southeastern States	1	0	0	1	5,270	46	34	0	0	0	1	1	0	0	0	39	39
Montana	7	3	2	2	10,485	216	237	0	0	0	1	1	6	0	5	20	31
Wyoming	4	1	1	2	15,670	180	132	0	0	0	0	0	11	0	4	29	44
Colorado-Utah	4	2	1	1	14,176	153	118	0	0	1	1	2	2	0	3	38	43
New Mexico	5	3	0	2	16,383	400	295	0	0	0	1	1	5	0	1	29	35
California	40	36	0	4	176,960	1,477	1,230	3	0	0	3	6	39	0	6	211	256
Total United States	698	367	69	262	2,331,242	24,634	21,854	18	2	3	81	104	534	71	164	3,023	3,792
Total previous week	724	392	87	245	2,328,826	23,936	21,295	12	2	9	87	110	516	69	161	2,942	3,688
Total Oct. 5, 1946	559	307	64	188	1,895,026			13	0	4	65	82	423	32	95	2,599	3,149

Service wells included: *21, †26, ‡6, §1, ¶2.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$1.80	....	....	....
19-19.9	1.85	....	....	....
20-20.9	1.90	$1.86	....	$1.42
21-21.9	1.73	1.87	....	1.44
22-22.9	1.77	1.90	....	1.46
23-23.9	1.80	1.91	....	1.48
24-24.9	1.84	1.93	$1.86	1.50
25-25.9	1.86	1.95	1.86	1.52
26-26.9	1.91	1.97	1.90	1.54
27-27.9	1.95	1.99	1.93	1.56
28-28.9	1.99	1.71	1.94	1.58
29-29.9	2.02	1.73	1.96	1.60
30-30.9	2.06	1.75	1.96	1.62
31-31.9	....	1.77	2.00	1.64
32-32.9	....	1.79	2.02	1.66
33-33.9	....	1.81	2.04	1.68
34-34.9	....	1.83	2.06	1.70
35-35.9	....	1.85	2.08	1.72
36-36.9	....	1.87	2.10	1.74
37-37.9	....	1.89	2.12	1.76
38-38.9	....	1.91	2.14	1.78
39-39.9	....	1.93	2.16	1.80
40 and above	....	1.96	2.18	1.82

*Standard Oil Co. of Calif. posting. †For crude from Daboval, El Campo, and Sandy Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED SEPTEMBER 27

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Production: Kerosine	Production: Gas & dist. oil	Production: Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	874	2,203	351	1,196	1,655	16,876	9,339	16,940	9,890
Appalachian:									
District 1	103	338	44	96	96	2,177	497	781	380
District 2	61	219	18	59	109	880	115	212	228
Ind., Ill., Ky.	855	3,091	323	966	1,106	14,300	3,119	8,362	5,450
Okla., Kans., Mo.	423	1,559	156	536	476	6,759	1,269	3,464	1,534
Inland Texas	239	936	93	141	405	2,520	637	566	843
Texas Gulf Coast	1,340	3,909	644	1,721	1,969	14,230	3,888	9,513	7,569
La. Gulf Coast	349	1,059	249	466	396	4,860	2,138	3,137	2,132
N. La. and Ark.	62	152	41	43	82	1,506	535	339	207
Rocky Mountain:									
New Mexico	10	28	4	7	15	71	15	21	30
Other Rocky Mtn.	134	362	19	131	242	1,563	163	913	669
California	831	2,595	80	774	2,029	14,730	1,114	14,158	27,845
Sept. 27, 1947	5,290	16,501	2,022	6,136	8,580	82,472	22,839	60,406	56,777
Sept. 20, 1947	5,280	16,366	1,993	6,275	8,772	81,987	22,254	59,283	56,934
Sept. 28, 1946	4,817	14,824	1,726	5,757	7,974	86,813	21,203	60,825	58,856

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 224,994,000 bbl. as of September 27—down 1,742,000 bbl. One year ago 223,043,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$1.96	Pecos County, Texas (Yates)	1.88
Kettleman Hills, California*	2.14	Bradford, Pennsylvania	4.30
Beauregard Parish	1.90	Eastern Ill. and Western Ind.†	2.97
Illinois Basin	2.97	Tomball, Texas Gulf Coast	2.10

*27°-27.9°. †38° and above.

TRENDS

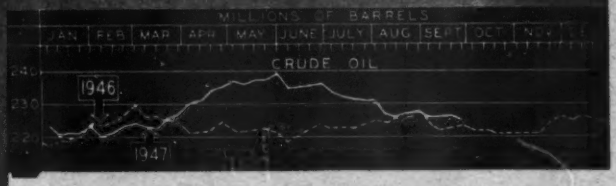
DAILY AVERAGE PRODUCTION FOR WEEK

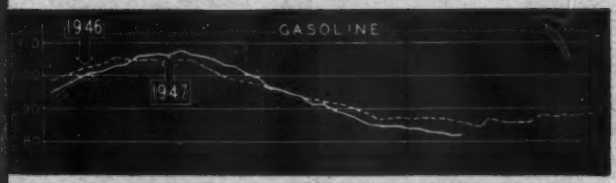
	Oct. 4 crude oil	B. of M. Sept. demand	Sept. 27 crude oil
Alabama	1,050	1,000	1,050
Arkansas	82,050	82,000	81,900
California	920,400	930,000	922,400
Colorado	47,150	44,000	48,430
Eastern	63,050	65,400	63,800
Florida	1,100	1,000	450
Illinois	170,600	200,000	169,400
Indiana	17,000	18,000	16,900
Kansas	288,200	309,000	296,800
Kentucky	25,600	27,000	24,900
Louisiana	446,375	445,000	441,650
North Louisiana	109,200	.....	109,050
South Louisiana	337,175	.....	332,600
Michigan	40,690	45,000	42,200
Mississippi	101,830	99,000	103,755
Montana	21,960	24,000	24,240
Nebraska	550	600	550
New Mexico	117,000	110,000	117,350
Oklahoma	388,800	405,000	398,200
Texas	2,358,100	2,290,000	2,333,755
Dist. 1 (Southwest)	24,350	.....	24,275
Dist. 2 (Southwest)	161,525	.....	160,675
Dist. 4 (Southwest)	254,925	.....	247,600
Dist. 3 (Gulf Coast)	495,600	.....	499,875
Dist. 5 (Eastern)	40,975	.....	40,875
Dist. 6 (Eastern)	118,425	.....	118,605
East Texas Field	315,425	.....	308,000
Dist. 7-C (West)	40,875	.....	41,260
Dist. 8 (West)	642,550	.....	637,650
Dist. 7-B (W. Central)	42,700	.....	40,975
Dist. 9 (N. Central)	132,750	.....	127,725
Dist. 10 (Panhandle)	88,000	.....	86,240
Wyoming	119,930	124,000	122,620
Total United States	*5,211,435	5,220,000	5,212,350
Change from prev. wk., dn.	915		

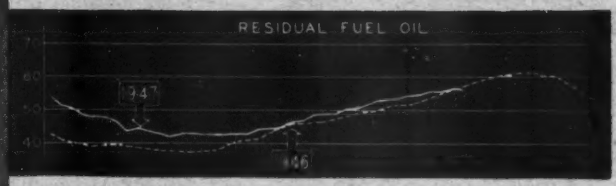
Total production January 1-October 4 †1,387,739,445 bbl.
Same period last year (crude plus cond.) 1,314,238,490 bbl.

*Not incl. 41,615 bbl. condensate. †Incl. 8,907,285 bbl. condensate.

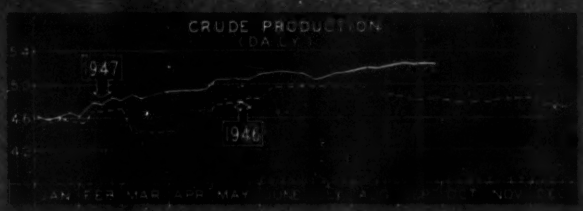
OIL STOCKS IN THE UNITED STATES



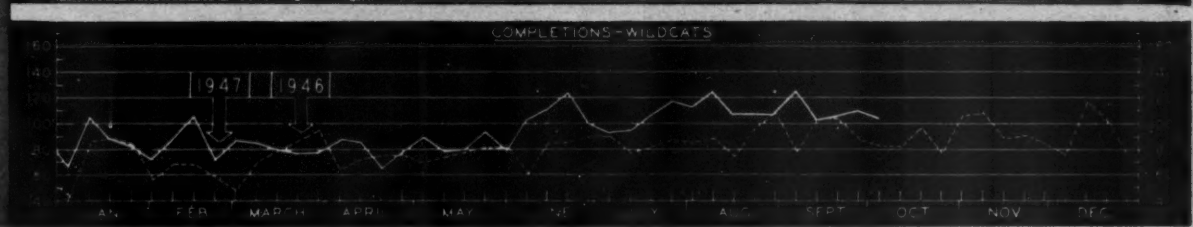




DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.

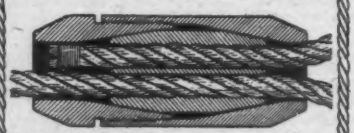


PENBERTHY
SUMP PUMPS

Used wherever seepage water accumulates, the Penberthy Automatic Electric Sump Pump and the Penberthy Automatic Drainer (water or steam operated) have demonstrated their superiority in this service. Simple and rugged design—copper and bronze construction throughout.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

LOOK INTO...
Cabl-ox
THE NEW WIRE ROPE CLAMP
That Really Holds the Line!



CABL-OX clamps work on a brand new wedging principle. Holding power increases with the load and exceeds tensile strength of rope used. Does not crush and weaken rope like old style U-clips. Assembly is fast, neat . . . saves breakdowns, equipment, injuries and expense. Can be used over and over. Cadmium plated.

Cabl-ox
Made in all sizes from ¼" to ¾". For all wire rope applications.
Your Cabl-Ox folder gives complete description and prices. Write for it today.
Now Manufactured by
CABL-OX CORPORATION
6 N. Michigan Ave., Chicago 2, Illinois

PAT. APPLIED FOR

MARKETS

DEMAND continued extremely heavy while prices remained firm at existing levels in petroleum product markets throughout the country this week.

There were some signs of a possible general increase in tank-car prices of burning oils in the near future. Buyers were still eagerly seeking supplies against possible shortages in the North-Central area this winter.

Publication price for No. 2 remained at 6⅞ cents, but spot trading for what little material was available was at prices ranging up to a full cent above the posted market. Jobbers were buying distillate heating oils with "little regard to price," as one official expressed the situation.

One marketer said gasoline demany is "easing imperceptibly," but continued heavy consumption of this No. 1 industry product as a result of warm autumn weather held the market in a strong position.

Mid-Continent No. 6 Weak

Warm weather prevented strengthening of the weak Mid-Continent position of heavy No. 6 fuel oil. One shipment of this material was reported to have moved at $1.90 per barrel. Return to service of one of Standard Oil Co. (Ind.) fire-damaged cracking units, was expected to strengthen the market.

On the Gulf Coast, demand for all products was reported high and prices generally unchanged.

In the New York harbor area, spot trading was still slow with most products moving only on an intersupplier loan basis or to old accounts. Demand for motor fuel was said to be continuing almost at the midsummer level, with several suppliers reported willing to exchange kerosine and some fuel oils in return for gasoline. It also was reported that residual fuel oil was tight. One buyer said he was unable to find any of this material, though he was offering premiums.

Tight Winter Supply Seen

A prediction that the East Coast burning-oil situation will be tight but without severe shortage this winter was made last week by B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc. In an interview in New York, he emphasized that the severity of the weather can alter present predictions. "The nation's winter temperatures over the years have varied from 10 per cent colder to 10 per cent warmer," he said. "Translated in terms of oil, a 10 per cent warmer or colder winter means roughly a 5 per cent drop or rise in the consumption of distillate fuels and 8 per cent in kerosine. That adds up to a lot of oil. . . ."

An indication of the future for motor-fuel consumption was given October 3 by M. E. Coyle, executive vice president of General Motors Corp. who in an address in Atlantic City, N. J., predicted total output of passenger cars and trucks this year will be about 5,000,000, second only to 1929. He said automobile demand will continue 3 to 5 years since the industry has not exceeded normal replacement since the end of the war.

Another report bearing on future oil consumption was that of the Bureau of Census on oil burners. Factory shipments in July totaled 100,524 units, down 4 per cent from June but more than twice the number shipped in July 1946.

Representative Quotations

Representative spot-market quotations of leading suppliers as of October 6, 1947. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	8¾-9⅛	10.5-10.9* 9.3-9.10†	9-10½
Premium gasoline, 78-80 octane	9½-11¼	10.2-12	9½-11½
42-44 w.w kerosine	7⅜-8	7.8-8.3	7½-8
No. 2 straw fuel oil	6⅜-7⅝	6.8-7.2	7¾
No. 6 residual	$1.95-2.15	$2.22-2.52	$2.00-2.52

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6¾	5⅞	6⅛
Grade 18-55	7.65	7.05	7.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-12¼
750 vis., No. 2-4 neutral	13-14½
2,000 No. 5-6 neutral	14½-16

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 p.p.	28
200 vis. No. 3 neutral, 0-10 p.p.	18-19

Western Pennsylvania

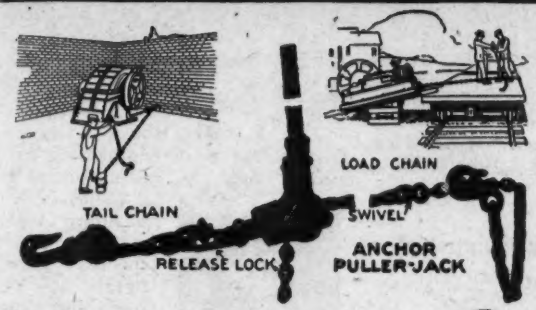
145-155 vis. 10 p.t. bright stock	45
180 vis. p.t. neutral	46

CRUDE-SCALE WAX

Mid-Continent

130-132 A.S.T.M. melting point	6¾-7¾

One Man Moves 5 Tons with the ANCHOR Puller-Jack!



Here's a one-man gang that quickly repays its price in labor, time and money saved. Has 3 tons direct pulling power, or 5 tons with sheave block. Pulls 15 feet without changing hold. Can be operated upright, sideways or upside down, with lever pull away from load or toward it. Simple, strong, foolproof. Practically nothing to get out of order. Positive action, always holds. Compact, quick and easy to set up and use. Hundreds of uses for this powerful tool wherever heavy objects must be moved. Order an ANCHOR Puller-Jack today, or write for descriptive catalog.

Easily carried and operated by one man.

$57.50 F. O. B. Bowerston, Ohio. Jack complete with 3 ft. steel tube handle, 15 ft. load chain with slip hook, and release lock. Longer chains available.

THE NOLAN COMPANY
Formerly The Mining Safety Device Co.
DEPT. OG • • • • • BOWERSTON, OHIO

McGREGOR
WORKING BARREL

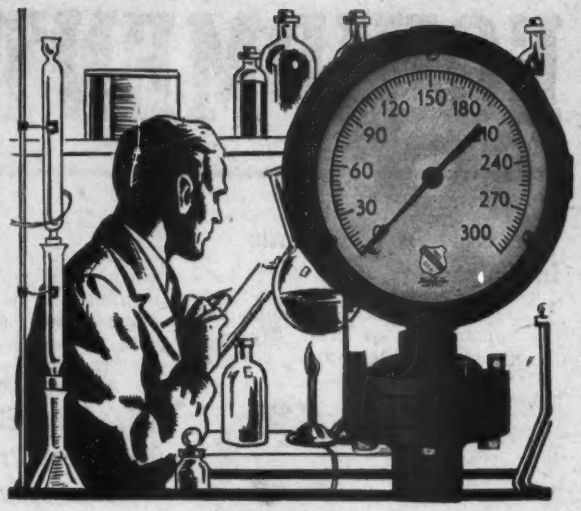
We are still doing business at the old stand, where we have been serving the oil trade for 50 years.

We manufacture ball & seats of all kinds and sizes. We have stainless, foster bronze, commercial bronze, and steel balls & seats.

We manufacture a great many different types of working barrels for pumping fluid out of the wells. The McGregor does away from pulling tubing and handles the same amount of fluid as the standard working barrel.

If interested write for circulars explaining everything, also price lists. If you can not get it at your nearest supply store, we will ship it direct to you.

McGregor Working Barrel Co., Inc.
106 Elm Street
Bradford, Penna.



Name your poison

CHEMICALS, Corrosives, Catalysts, Acids, and Viscous materials used in modern refining and industrial processes, are all safely and easily handled by the ASHCROFT CHEMICAL GAUGE.

With diaphragms and diaphragm chambers protected by stainless steels, lead, tin, silver, platinum, tantalum, rubber, nickel, Hastelloy, Beryllium Bronze and other special materials, this gauge is the answer to the many pressure indicating problems constantly confronting the Chemical, Petroleum, or Metallurgical Engineer.

Viscous substances cannot clog the gauge mechanism. A removable diaphragm housing and oversize pipe connection provides easy accessibility for cleaning. Special flange mounting construction permits direct attachment to apparatus when desirable for fluids which harden at atmospheric temperatures.

Furnished for all pressures up to 1000 p.s.i., the ASHCROFT CHEMICAL GAUGE incorporates the famous Rotary Geared Movement, the corrosion-resistant laminated plastic dial, and other outstanding features which have contributed to ASHCROFT leadership for nearly 100 years.

Stocked and sold by leading Distributors everywhere... When you order gauges, insist on ASHCROFT... Write for booklet.

MAXWELL MANNING MOORE TRADE MARK

ASHCROFT *Gauges*

A Product of
MANNING, MAXWELL & MOORE, INC.
BRIDGEPORT 2, CONNECTICUT
Makers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves and 'American' Industrial Instruments.

EQUIPMENT MEN ... in the News

Two New Appointments In Chiksan

Chiksan Co., Brea, Calif., announces the appointment of L. C. Myers to the Rocky Mountain area, covering

L. C. MYERS

R. JONES

the states of Colorado, Wyoming, and Montana, with headquarters in Denver. Myers has been with Chiksan since 1944 and handled field service in California prior to his new appointment. Robert Jones has been assigned to the New York office as sales engineer in the New York territory where he joins E. T. Landgraff, manager, and R. W. Sexton, Jr. He has been a member of Chiksan's engineering staff for the past several years.

Kelite Establishes Foreign Distributorship

As an expanded service to overseas and Latin-American offices of United States manufacturers and their distributors, Kelite Products, Inc., has recently set up distributing points at Panama City, San Salvador, La Ceiba, Honduras; San Jose, Costa Rica; Curacao, N.W.I.; Mexico City, and at Sidney, Melbourne, Brisbane, Newcastle, and Adelaide, Australia.

L. C. Sorensen, president of Kelite, will leave Los Angeles for Europe early in October to arrange for distribution in South Africa, India, and other points as part of the company's program for world-wide availability of its specialized industrial cleaning materials.

Routh Joins Foxboro At Shreveport

Foxboro Co., Foxboro, Mass., makers of industrial instruments for measurement and control, announces the appointment of Milton E. Routh as manager of the Shreveport office territory, succeeding E. A. Thomas, resigned. Routh has spent most of his life in the Southwest and is well acquainted in industrial circles there. Since completing his educational training he has been continuously engaged in instrument engineering with two of the leading oil refining companies.

Texoma Exclusive Distributor Texasteel Product

Texoma Supply Co., Tulsa, has become the exclusive sales representative in the United States for Texasteel sucker rods and related products, according to an announcement by Carl J. Hochenauer, president of Texoma. Texoma has added some Texasteel sales personnel to the Texoma organization and will maintain complete sales service from Houston and Fort Worth, and from general headquarters at Tulsa.

Ray H. Smith, vice president and general sales manager of Texoma, will direct the sale of Texasteel products. W. A. Scott will be in charge of the Houston office, which is in the West Building. W. O. Satterwhite will be in charge of the Fort Worth office, 3909 Hemphill Street. Both of these men were formerly associated with Texasteel Manufacturing Co. in a similar capacity.

Craver Visits South America

Kenneth Craver, Thornhill-Craver Co., Houston, manufacturers of Unibolt products, is making an extended tour of South American oil fields. Mrs. Craver will join him soon in Caracas, Venezuela, and they will then proceed to Argentina, Brazil, and Chile, returning to the United States in December.

Eckel Reports on South America

John E. Eckel, Houston, vice president in charge of engineering for Oil Center Tool Co., has returned from a 10,000-mile trip to South America where he inspected the oil fields of Venezuela and Colombia.

The Houston engineer, who was with Humble Oil & Refining Co. for 16 years before joining Oil Center Tool, found the Bolivar coast area of the Maracaibo basin in Venezuela to be the most active oil section in South America. He reported extremely active drilling and wildcatting in eastern Venezuela, particularly in the Greater Oficina area and near San Joaquin.

Humason to Form New Company

Granville A. Humason, Houston, formerly with Hughes Tool Co., is forming a company to put on the market a new-type drill-stem tester and a slide-valve gas lift. Judge E. E. Townes, with offices at 1315 Esperson Building, formerly with Humble Oil & Refining Co., is handling the organization of the company.

Newland Appointed Kansas City Manager

Carmen F. Newland has been appointed manager of the Kansas City district of the industrial products sales division of B. F. Goodrich Co.

New Marsh Steel Corp. plant recently has been completed at 101 East Ninth Street, North Kansas City, Mo. Warehousing activity is centralized in a temperature-controlled area approximately 126 ft. wide and 401 ft. long. Offices and employe facilities adjoining the warehousing structure increase building area to 60,000 sq. ft. Material handling is mechanized with two 5-ton 60-ft. overhead cranes traveling the full length of the structure. Modern equipment is used throughout plant

All salesmen of Fred E. Cooper, Inc., attended a 4-day conference recently at the home office and plant in Tulsa. The meeting program was divided into a number of special discussion groups, schools of instruction, and talks by specialists representing several manufacturers. (Front row) Shown in the photograph are H. B. Appleton, secretary; Louis Gasche; H. B. Bloxom, sales manager; A. D. Brunk; R. B. Rubottom; J. A. Cott; E. Franks, Allis-Chalmers Mfg. Co.; B. S. Scott; Roy Kalb; E. E. Everson; A. T. H. Graham; and E. Woolbert, engineer. (Back row) Dave Fink; L. D. Morris, field service, Fairbanks-Morse & Co.; F. Richardson; J. W. Allen, shop superintendent; Harry R. Kramp; B. R. Wiggins; J. F. Hardin; C. F. Nelson; K. Flett, parts manager; Fred E. Cooper, president; H. E. Cooper, executive vice president; and C. H. Hudson

Bloxom New Sales Manager of Cooper

At the general sales meeting of Fred E. Cooper, Inc., held at the home offices recently, the appointment of H. B. "Buck" Bloxom as sales manager was announced. Bloxom is one of the oldest men, in time of service, with the organization, having joined Cooper in 1929. During this period he has traveled every domestic territory served by the company. Bloxom is considered an authority on Allis-Chalmers well-servicing equipment and power engines. His headquarters will now be at the general offices and plant in Tulsa.

Cooper-Bessemer Names Kahrl Controller

F. William Kahrl has been appointed controller of Cooper-Bessemer Corp., Mount Vernon, Ohio. Kahrl assumes position formerly held by James E. Brown, who was named treasurer to succeed Zenno E. Taylor upon his retirement nearly a year ago. Since that time, Brown has held both offices but recently resigned as controller to devote his full time to the duties of the treasurer's office.

Oil Well Makes Gulf Coast Changes

T. P. Drummond has been appointed manager of refinery and pipe-line sales for Oil Well Supply Co.'s Gulf Coast division. J. E. Shoemake, Houston, and J. T. Love, Beaumont, have been named district engineers, refinery and pipe-line sales; and R. L. Humphrey, division tubular representative, has been transferred from New Orleans to the division office in Houston.

R. M. White Named North Texas Manager

In line with the recent announcement that Franks Manufacturing Corp., Tulsa, had expanded its sales facilities by offering its skid, truck, and trailer-mounted rotary-drilling rigs and servicing units through supply stores, Carl White, Jr., president, has appointed R. M. (Dick) White northern Texas division sales manager, with offices at 825 Neil P. Anderson Building in Fort Worth.

Prior to joining the Franks organization in 1935, Dick White had been active throughout the Mid-Continent oil fields as a rotary-drilling field engineer. Since that time he has been Franks sales representative in the North Texas area.

Bruhn to Dallas Office

F. Erick Bruhn has been appointed to Mid-Continent Supply Co.'s district office in Dallas, where he will specialize in machinery and Cummins diesel engine sales. Bruhn, an Army reserve officer, left Mid-Continent's Houston office at the outbreak of the war to become connected with the procurement and operation of machinery and equipment for Army floating craft. He served with that section 4½ years, both in the United States and abroad.

Warren Completes Propane Tank Ship

(Continued from page 51)

off valves are installed for loading and unloading operations. The inflammable-atmosphere detectors are arranged to sound an alarm if the gas-air mixture ever reaches 40 per cent of the lower inflammable limits. This alarm is sounded in the pilot house and in various other sections of the ship.

Pumping Equipment

Pumping equipment aboard ship consists of six 500 to 800 g.p.m. centrifugal units which operate at pressure differentials sufficient to care for all line friction and head differences in various loading and unloading operations. The main compressor installed aboard ship is a centrifugal type rated at 1,575 cu. ft. per minute at a 220-psi differential and 250-psi. discharge pressure. A rotary compressor with a 100-hp. turbine drive serves as a standby unit.

When unloading the ship storage tanks into shore installations a pressure-equalizing line is connected to both tanks, and transfer of propane is made by pump operation. Where this is not feasible the contents of the delivery tank is displaced with propane vapor supplied by the compressor at required pressures. The compressor also operates to recover tank vapors from which all liquid has been removed. Pressure in the vapor-containing tanks is reduced to 30 psig. in this operation. Discharged vapors thus recovered are condensed and delivered as cargo revenue. Recovery runs as high as 5 per cent during summer months.

Safety Features

In working out the details involved in converting the vessel, structural and operational safety were controlling factors. For example, maximum cargo space had to be obtained without disturbing any of the main parts of the ship's structure if the venture was to prove profitable. In consequence, and possibly to some sacrifice of revenue, water tightness of all bulk heads in the ship's 5 holds was maintained. Each hold is provided with identical safety measures and because loading and unloading operations are carried in a closed process system there is no possibility for gas or vapor to escape at any point aboard ship.

When considering all of the safety precaution incorporated into the new tanker's design which are in addition to those required by the U. S. Coast Guard and the American Bureau of Shipping the S.S. Natalie O. Warren may rightfully be considered the safest tanker afloat today.

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads except Situations Wanted. 10 cents a word. Minimum charge, $2.00 per insertion.
Situations Wanted ads, 5 cents a word. Minimum charge, $1.00 per insertion.
Centered Line, any ad, 75 cents.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

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$9.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 197, Red Fork Station, Tulsa, Oklahoma

FOR SALE: 150,000 board feet of used road lumber located in Thornwell Pool Section 28-11-9w, Jefferson Davis Pariah, Louisiana. Please contact O. C. Brown, Cities Service Oil Company, Gladewater, Texas.

EQUIPMENT FOR SALE

FOR SALE: 1200 feet good 2⅞ inch pipe $1.35 per foot F.O.B. Ft. Worth, Texas. Drawer 1600, Fort Worth, Texas.

FOR SALE: Cardwell-H Spudder, complete. Steel dog house, Kohler Light Plant, tools and lines. Price $7000.00. Blalack Drilling Company, Mt. Vernon, Illinois. Phone 2451.

FOR SALE: Super J Fort Worth Spudder, complete string tools, 20" down to including 5" with new 3000'—⅞" line. 1st class condition to start drilling, nothing needed. J. R. Fester, 309 North 15th, Fredonia, Kansas.

FOR SALE: 10,000 sq. ft. steel airplane landing mat, 18" x 10' Sections. Will make into portable all-weather lease road for hauling equipment, etc. 10c per sq. ft., F.O.B. Tulsa, Oklahoma. Subject to prior sale or withdrawal. Also have several light plants at bargain rates. Marshall Travis, 110 Midco Bldg., Tulsa, Oklahoma. Phone 5-2261.

FOR SALE
Ruska # 8040, Type V.R. Magnetometer, vertical recording field balance with compass in mahogany carrying case and tripod with leather bag. This instrument was used for a little over six months and is in exceptionally good shape—offered, subject to prior sale, for $2,100.00 F.O.B. Laboratory, North American Geophysical Co., 2527 Westheimer Road, Houston 6, Texas.

FOR SALE

NEW Gruva-grip and Victaulic Couplings, complete with bolts and gaskets, attractively priced

120,000 pcs. 6" Standard Pipe Size
40,000 pcs. 4" Standard Pipe Size

We cannot guarantee to furnish any particular make but at present we have both makes in stock.

ALBERT PIPE SUPPLY CO.
Berry & North 13th St., Brooklyn 11, N. Y.
Phone: Evergreen 7-8100

L. B. FOSTER CO.
P.O. Box 1647, Pittsburgh 30, Pa.
Walnut 3300

ALBERT & DAVIDSON PIPE CORP.
2nd Ave.—30th, 31st St., Brooklyn 32, N. Y.
Phone: Windsor 9-6300

EQUIPMENT FOR SALE

200 SULLIVAN Drilling Rig thoroughly reconditioned. Complete with drill pipe, tools, and trucks. Also reconditioned 37 Sullivan complete. This is good equipment. F. D. Bridges, 1109 Euclid, Oklahoma City, Okla. Phone 3-7810.

FOR SALE: 2 67 horse Hercules gasoline power units direct connected to 120 v. 250 amp D.C. generators. Mounted on steel wheels with steel housing and electric starters. First class condition $600 each.
5—2000' reels of new 9/16" 6x19 improved plough steel hoisting cable with wire rope center. P.O. Box 4313, Memphis, Tenn.

MODEL 2000 FRANKS Core Drill Mounted on K-11 International Truck. Good as new with savings of approximately $5000.00. Located vicinity of Houston. Halloran Equipment Co., 431 Kress Bldg., Houston, Texas. Phone Capitol 6810.

3300 FT. 3½ in. new drill stem; Reed tool joints; $3.25 per ft. f.o.b. Clay City, Ill. Lot only. 10,000 ft. 6⅝-in. used 11 lb. lap weld well casing; shopped; $1.20. 2000 ft. used 7 in. 20 lb. well casing; shopped; $1.60; f.o.b. Wichita, Kansas. Leland Waggoner, 1209 W. University, Urbana, Illinois.

FOR SALE
2—125 H.P. 350# Working Pressure "OIL WELL BOILERS." EXCELLENT condition. Completely reconditioned. Not used since last approval by State Boiler Inspector. Priced to sell.
POWEL BRISCOE, INC.
1916 First National Bldg.
Oklahoma City, Oklahoma

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Large and Small

All are truck mounted, rotary, chain pull down, smallest pump size 4 x 6. Some are in excellent condition; others need repair. Price F.O.B. Dallas, from $3,000 to $8,000, including truck.

For details write

6060 LEMMON AVENUE, DALLAS, TEX.

FOR SALE

1—45-C Star Spudder; Climax Engine; Tools complete with wire line and hand tools.

1—Heavy Duty Steel Spudder; Young Engine; Tools complete with wire line and hand tools.

Butane-Propane Equipment

CASING

300'—15½" 70-pound L. W.

700'—13¾" 48 pound H-40

2000'—10¾" 40.5-pound H-40

Will sell casing with either string of tools.

All located Tulsa area and in excellent operating condition.

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